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LEGISLATURES AND RATE-MAKING.

The Massachusetts House of Representatives has definitely gone on record as a conservative body in refusing to allow the East Boston Eighty Cent Gas Bill to become law, and as a result of far-sighted work on the part of Speaker Walker, the policy of rate-making by commission has become more firmly established than ever before in that state. This action is of wide interest to public-service corporations in general; for while the local interests involved were almost inconsequential, an important question was at stake, namely, whether the Legislature or its expert commissions shall undertake the problems of rate-making. The East Boston bill was in its final stages when Speaker Walker took the floor and vigorously protested against its passage on the grounds that the Legislature is unqualified to pass upon technical problems of this character; that the Massachusetts plan of corporate regulation by commission has proved successful and equitable for upward of forty years; that the assumption of the rate-making power by the Legislature in such a case would be as culpable as the famous two-cent fare enactment in New York, which was vetoed by Governor Hughes; and that such a weakening of the powers of the Gas and Electric Light Commission, which has shown itself over and over to be a competent, impartial board, would inevitably drive away investors in public utilities to the great detriment of the commercial welfare of the State. This is sound sense and should be repeated elsewhere.

THE CONVENTION SEASON.

Once again we are in the convention season. On other pages of this issue there is published a comprehensive report of the proceedings of the Iowa Electrical Association and of the Iowa Street Railway Association, both conventions being held last week at Cedar Rapids. In connection with this convention there was an exhibition of electrical appliances of considerable dimensions, representatives of nearly one hunderd companies being in attendance. The Southern Electrical and Industrial Exposition, which closed a most successful run at Louisville, Ky., on April 24, was satisfactory far beyond the expectations of its projectors, and in point of attendance and in enthusiasm aroused made significant bid for local popularity. Next week the American Electrochemical Society meets at Niagara Falls, Ontario, May 6, 7 and 8, with an excellent program and some very interesting entertainment features. The Niagara Falls district is always a point of interest to electrical engineers, and this interest has been enhanced by reason of the remarkable

ice-jam which caused considerable damage and almost threatened disaster to some of the power companies only last week, the marks of which will not have been entirely obliterated when the meeting shall have taken place. One of the important features of this convention is the elaborate list of papers devoted to electro-metallurgy. A great deal of attention is now being focused upon the developments in electric-furnace operation, and the program arranged by the American Electrochemical Society will bring down to date the best information extant upon this important subject.

At Omaha, Neb., the Omaha Electrical Show will hold forth from May 6 to 15, and it is expected that there will be a strong representation of manufacturers both large and small, with a large attendance of central-station men from the entire western field. The convention of the Nebraska Electrical Association will be held at the same time. The Arkansas Association of Public Utility Operators holds its annual meeting at Hot Springs on May 12, 13 and 14, while the Southwestern Electrical and Gas Association will hold its annual convention at Dallas, Texas, May 20, 21 and 22. The American Association of Electric Motor Manufacturers will hold an important meeting at Hot Springs, Va., May 27 and 28.

Arrangements for the annual convention of the National Electric Light Association, which is, of course, the classic in the electrical industry, are proceeding apace. An excellent tentative programme has been announced, and it is expected that the convention, which will be held this year at Atlantic City, N. J., June 1, 2, 3 and 4, will be a banner event. There will be a large delegation from all the eastern cities and a special train, connecting with all the important centers en route, will leave Chicago on May 30.

The American Institute of Electrical Engineers holds its annual convention at the Thousand Islands, N. Y., the week of June 28, an excellent program for which is being formulated. The Ohio Electric Light Association, one of the most vigorous State organizations connected with the electric-light industry, will hold its convention at Toledo, July 13, 14 and 15, and a week later the National Electrical Contractors' Association, the purchasing power of which runs up into the millions, will hold forth in the same city July 21, 22 and 23.

INDUSTRIAL EDUCATION.

The Educational Committee of the American Institute of Electrical Engineers held a meeting in New York city recently, at which the topic for discussion was "The Fundamental Principles of Industrial Education." The leading paper was presented by Herman Schneider, Dean of the College of Engineering of the University of Cincinnati. A year ago the Educational Committee discussed the fundamental principles of technical education.

Dean Schneider points out early in his paper that we are prone to look upon the subject of industrial education from our own narrow viewpoint, and this is exactly what we did at the meeting the other night. We will not get down to the fundamentals of industrial education until we separate entirely the idea of looking at industrial training in the same way as we do at engineering education. For instance: the excellent suggestion made by Mr. Taylor, of taking a young man from college at the end of his Freshman year and giving him a year's practical experience in the shop, allowing him then to return to finish his college work; because in this wise the young man would be taken at the period when he would be best fitted for such study, and would in leastwise interfere with the shop organization.

This was referred to by several speakers and endorsed more than once as a solution of this problem. Other suggestions were made having in mind the young man with a college education rather than the lad and the girl to whom such education is denied. This is hardly the phase of industrial training upon which we believe the committee was bent in raising a discussion.

Now if we understand industrial education aright, it means the training of the artisan and the mechanic, those who work at the industry, to become more efficient. Our boys are not sent to college to go at the end of their Freshman year into the machine shop to work as bench hands for a year; then to go back to school and upon securing their degrees become boilermakers or blacksmiths. This experience is fine for them, but they want to use it for something that pays good wages and allows them to mix in cultured society, and live the life of the intellectual and highly desirable citizen.

If industrial education is to meet the need for clean-cut, intelligent, conscientious artisans and mechanics, and the manufacturers state that we are coming nearer and nearer to a paucity in the supply, then the manufacturers, those who will most benefit by increasing the efficiency of their workmen, must be the leaders in the movement for better training. They must do it either by establishing in their works schools where men may receive some degree of instruction and culture which they had been deprived of by going to work at too early an age, or they must support and impress upon a paternal government the necessity of establishing free night schools for instruction in the same directions.

What class of boys and girls do we find in our workshops? Usually those who either through willfulness or stern necessity have been separated from study at school and found employment wherever it might be available and at whatever wages would sustain them and meet their immediate needs. Some are industrious and conscientious and remain so, no matter how irksome the work, and despite little incentive to improve their standing either in society or in their occupations. A good many suffer moral and physical collapse under discouraging conditions and bequeath to posterity, if in this case there be posterity, not even ambition or hope. Others grasp every opportunity of supplementing the daily task by gaining instruction at free night schools, and, if they can afford it, by attendance at trade schools and by subscribing to correspondence school courses. Few, however, who strive for higher education do so with the idea of becoming better fitted to do the work at hand. Rather the struggle of the ambitious is to get out of the old trade; to

quit the machine and the bench; to get into some near-profession, and to attain to the alluring status of the college-bred man.

The rank and file of artisans and mechanics found in every phase of industry require more than anything else the ability to read and write well, to figure simple problems, and to think coherently and to act intelligently. The aspirations toward culture and intellectual attainment will naturally induce habits of greater cleanliness and will assure a more logical conception of domestic relations, quickening the impulses of loyalty and establishing better beliefs concerning the rights of others. Those who are going to make a greater success of their lives than is ordinarily the aim of the workman will avail themselves of any opportunity which may increase their efficiency. The opportunities for outside study are greater today than ever they were before. Men have succeeded in raising themselves from the bench to positions of responsibility and munificent emolument through sheer audacity and persistence, when it was hard indeed to secure the education necessary to supplement their own endeavors. They can do it today, and they will as long as the opportunity exists.

The co-operative plan described by Dean Schneider has in it the fundamentals upon which the problem may be approached. However, it would appear that when the boy or girl is at school they should be at school for academic instruction, and whatever manual training they get should be complementary to this instruction. When they start to work they should be at work in earnest, and whatever academic instruction they get at this time should be complementary to their practical endeavors. What we need to look into essentially is what opportunity we are going to give to the young man who fits himself to serve us more efficiently. What will his incentive be? There are not enough foremanships and superintendencies available to compensate the entire host of men who could make themselves more highly efficient. Outside of this, then, there must be some incentive.

Who knows the needs of the producers? We answer at once, why the producers! Who knows the needs of the workers; who knows what incentives are necessary in order that there may be a logical reason for improvement in efficiency? Why, the workers! If this be true, then, the producers, or manufacturers, must see the workers. If the latter must be educated to better meet the needs of the former, and, in fact, all of us, including themselves, they will only be educated with their own consent.

The manufacturers in every phase of industry have organizations to which they subscribe for mutual helpfulness. The individual manufacturer feels that alone he cannot handle a number of problems affecting his business, and he therefore assembles with his brother manufacturers, forms an organization, and delegates to certain individuals specific tasks. These individuals become the spokesmen of the business associates and concentrate their energies upon bringing order out of chaos and in establishing relationships which will make for the safe and pleasant conduct of business.

So, the laboring man, patterning after his employer, has formed his organizations, and likewise has delegated to individuals specific tasks. Too often, to the misfortune of a host of good, honest, skilled workmen, the official representative has been arrogant, been guilty of atrocious cupidity, and has brought workingmen's organizations into disrepute. Still these organizations do exist, and by and large they have, willy nilly, improved the condition of labor (at least the laboring man thinks so). We are not advocating the recognition of trades unions, but we are advocating that the problem of industrial training be worked out between the employers and the employed. Any discussion of this subject that does not recognize all the factors in it will prove unavailing. The representatives of the employers must work with the representatives of the workingmen. The engineers and the educators must work with both. We will all be better off when we know more about it. While we are educating others, however, let's do a little more for ourselves.

THE TELEPHONE AS AN INDISPENSABLE REQUIREMENT.

Only a week or so ago in a paper presented before one of the national engineering societies the author, in referring to the magnitude of industrial development, and indicating a method of discovering the many ramifications into which each industry is split up at the present time, suggested a search through the classified trade index of a telephone directory. Rarely today does one refer to the ordinary city directories, as it has become quite popular to make quick reference to those who possess telephone instruments. In other words, the universality of the telephone is acknowledged, and it is considered in business as a necessity even beyond the importance of some of the personnel of the business organization.

In this connection it is interesting to note a recent decision of the Corporation Commission of Oklahoma in ordering the Atchison, Topeka & Santa Fe Railway to install and maintain a telephone station at its depot in the town of Skedee for the use of its agent in answering all inquiries of the public for which telephones are usually used, on the ground that a telephone in this depot was a necessary convenience. The commission holds that it is the duty of the railway company to furnish a means of communication with the public according to the modern usages and customs. If the company should place a deaf and dumb person in charge of the station it could not be contended that this was adequate service, and inasmuch as all of the business such as inquiring as to the time of trains, the arrival of freight, rates and various other questions can be and usually is transmitted over the telephone, the commission could see no reason why this means should not be extended and become a part of the service between the railroad company and its patrons and customers. The Supreme Court of Oklahoma confirms the Commission's order, holding that a telephone is an indispensable aid in the conduct of the business of a common carrier at any center of population, and has become a necessity, both within the rule of the common law as well as by the provision of the Constitution of Oklahoma.

COPPER PRODUCTION IN 1908 AND THE PRESENT OUTLOOK.

BY JOHN B. C. KERSHAW.

The consumer of copper during the past year has had a less anxious time than in 1906 or 1907, for the price of the red metal has varied only within what may be termed moderate limits, and the great fluctuations in value which characterized the year 1907 have not been repeated. The following list of average prices of standard bar copper for each month of the year 1908 shows that the market has been singularly free from the excitements of the two previous years:

January	$305.72	July	$299.37
February	290.72	August	305.72
March	300.00	September	295.37
April	285.12	October	308.75
May	290.00	November	319.37
June	283.12	December	318.75
Average for the whole year			300.12

Since the opening of the present year the price has fallen to $275. The questions which consumers are now asking themselves are whether it will be wise to procure supplies ahead of present requirements on this basis of value, or whether it will be more advisable to trust to the prices "sagging" still further, in which case a hand-to-mouth policy would be the more economical.

The writer in this article proposes to submit the production and price statistics of the last nine years to an exhaustive examination in order to see what light they throw on the answers to these questions. The figures used in this study will be those compiled by Henry R. Merton & Company, metal brokers, of London, and published by them annually.

PRODUCTION IN THE PERIOD 1900-1908.

The aggregate copper output of the past year has amounted to 784,625 tons, or to nearly three-quarters of a million tons, and is the largest on record, being an advance of 34,760 tons in the total for 1907. This increase, worked out as a percentage, represents 4.87 per cent on the previous year's total, and is only slightly below the average of the last nine years. The detailed figures for the nine-year period are as follows:

Year.	Aggregate Output by All Countries, in Tons.	Increase or Decrease.	Percentage.
1900	479,514	+ 7,270	1.5
1901	516,628	+37,114	7.7
1902	541,295	+24,667	4.7
1903	574,775	+33,480	6.1
1904	644,000	+69,225	12.0
1905	682,125	+38,125	5.9
1906	714,100	+31,975	4.6
1907	713,865	— 235	— .03
1908	748,625	+34,760	4.8

Average rate of increase, 5.2 per cent.

The check to production in the year 1907 has therefore been wiped out by the increase of 1908, and the above figures seem to indicate that the limit of producing capacity of the copper mines of the world has not yet been reached.

Turning now to the consideration of the figures for the different producing countries, and classifying these in order of their output, we obtain the following tabulated statement of the production of the twelve most important copper-producing countries of the world in the period of 1900-1908:

	1900.	1902.	1904.	1905.	1906.	1907.	1908.
United States	263,502	292,870	365,050	389,120	409,650	392,520	425,175
Spain and Portugal	52,872	49,790	47,085	44,810	49,320	49,675	52,585
Japan	27,840	29,775	34,850	35,910	42,740	48,935	43,000
Australasia	23,020	28,640	34,160	33,940	36,250	41,250	39,500
Chile	25,700	28,930	30,110	29,165	25,745	26,685	38,315
Mexico	22,050	35,785	50,945	54,440	60,625	56,565	37,570
Canada	8,500	17,485	19,185	20,535	25,460	25,615	28,570
Germany	20,411	21,605	21,045	22,160	20,340	20,490	20,200
Russia	6,740	8,675	10,700	8,700	10,490	15,000	20,085
Peru	8,220	7,580	6,755	8,625	8,505	10,575	15,000
Norway	3,935	4,565	5,415	6,305	6,125	7,010	9,190
Italy	2,955	3,370	3,335	2,950	2,865	3,300	2,975

These twelve countries, in 1908, produced 732,000 tons, or ninety-eight per cent of the total copper output of the world, and the production of the remaining countries is therefore of little account in connection with the aggregate of supplies.

A cursory glance at the table shows that the mines of the United States still occupy the predominating position in the copper world, and that whereas in 1900 their contribution represented fifty-five per cent of the world's total output, in 1908 the proportion had risen to nearly fifty-seven per cent.

Only one check has occurred to the production of these mines, namely, in 1907, when a decrease of 17,000 tons was recorded.

As regards the remaining eleven countries, Spain and Portugal still keep second place, with an output of 52,000 tons, while Japan with an output of 43,000 tons ranks third, and Australasia with one of 39,500 tons comes fourth. Mexico, which in the year 1906 had risen to the position of second in the list of producing countries, with a production of 60,625 tons, has fallen back to the sixth place with an output of 37,570 tons in 1908, and Chile now ranks ahead of it. The accompanying diagram makes these changes more clear and enables one to see at a glance the general rate of increase in the producing capacity of the mines in nine of the twelve leading countries.

The most notable feature of this diagram is the sharp break in the line representing the output of the Mexican mines and the lesser breaks in the lines of the Japanese and Australian production. These declines indicate that in the three countries named there are copper mines which can only be operated profitably when copper is selling at sixteen cents per pound, equal to $360 per ton or over, and therefore so long as the present reign of lower prices lasts, it will be unlikely these mines will again enter the producing stage.

There are, no doubt, in the United States many smaller mines and mining companies occupying a similar position, but their decline is overshadowed by the enormous increase in the producing capacity of the principal copper mines. These mines now have larger ore reserves exposed and ready for extraction than at any earlier period in their history.

The setback in mining activity of the year 1907 has in fact been used by the managers of the larger copper mines in the United States for the development of their ore resources, and it is stated that the ore can now be mined and brought to the smelters at a lower cost than ever before. It is therefore evident that these mines can produce copper at a profit and earn dividends when other mines and companies can barely pay their working expenses, and it has been stated recently that eight cents per pound (equal to $180 per ton) represents the cost of production by the more favorably situated large producers in America. The effects of this decrease in the cost of production will be discussed in the final section of this article.

PRICE VARIATIONS—1900-1908.

The following table gives the average price of standard bar copper for the nine years covered by this review:

Year.	Price.	Year.	Price.
1900	$367.64	1905	$345.62
1901	339.81	1906	431.29
1902	263.35	1907	435.41
1903	289.66	1908	300.12
1904	293.66		

It is interesting to note that the average for 1908 is higher than the average price of the last twenty years, and that therefore the mine owners are obtaining at the present level of prices what may be regarded as an average return upon their investments.

Extending the study of price variations back to the year 1885, and plotting the figures in diagrammatic form, we have a very instructive curve for the range of copper prices in the period 1886-1908. (Fig. 2.)

The enormous rise and collapse of prices

in the year 1888 was due to the abortive Paris corner engineered by M. Secretan. The somewhat longer reign of high prices in 1899-1900 was the result of the pooling of interests in the United States and the formation of the Amalgamated Copper Company. The inflation of prices of the years 1906-1907 has differed from those which preceded it, since it has been due to natural rather than to artificial causes, *i. e.*, the demand for copper had exceeded the supplies; but like the two previous periods of high prices it has been short lived, and copper is again down to what may be regarded as its more natural level of value. The line of price has, in fact, once more descended rapidly from the highest point yet touched upon the diagram shown above.

THE PRESENT OUTLOOK.

The writer believes that the price of copper will descend to a lower level before any recovery in value occurs, and that the present depression will continue until the general manufacturing industry of the old and new worlds has regained its wonted activity.

Copper is so largely used in the engineering, ship-building and other important industries, and enters into such a variety of works and factories, that the demand for the metal is to some extent an index of the prosperity and activity of the world's manufacturing industries. When trade is brisk and ship-building active, the demand for copper is good, and the price of the metal has a tendency to soar upward, irrespective of any financial manipulation of the market. When trade is bad, the tendency of prices is downward.

Now, the present low level of prices is almost entirely due to the trade depression of 1907, which has not yet passed away, and the recovery when it comes will follow rather than precede the general recovery of trade activity.

A feature of the present position of the copper market which deserves consideration is the large stocks which are known to be accumulating in the manufacturers' and dealers' hands, on both sides of the Atlantic. In the United States the stocks on March 1 amounted to 173,284,000 pounds, equal to 77,000 tons, and it is estimated that in the copper warehouses of the ports of Europe over 50,000 tons are stored. This large total will have to be disposed of before any marked recovery in price can occur, and as there are no signs at the present moment that the larger producers intend to diminish the output from the mines and smelters in order to accelerate the absorption of this copper, the writer believes that prices will sink still lower before any recovery occurs.

Consumers therefore during the present year should buy only in accordance with their immediate needs and should defer making important covering contracts for

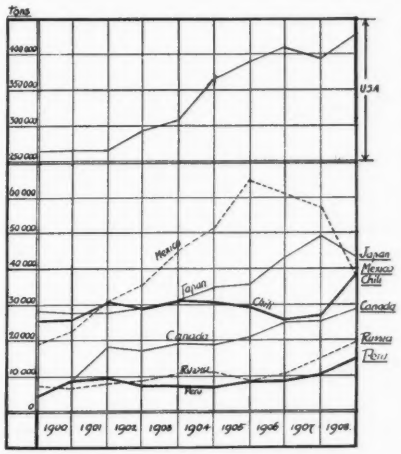


FIG. 1.—COMPARISON OF COPPER OUTPUT 1900-1908.

future requirements until the general trade revival which will herald the next period of high copper prices is actually in full sway. Even then, the inflation of price of the red metal may be slow, for the reduced cost of production in the United States already referred to should lead the mine owners to be satisfied with a permanently lower level of prices.

In electrical engineering work, aluminum is proving a formidable rival, and at its greatly reduced price it is certain to become more largely used as a substitute for copper as time passes on and its

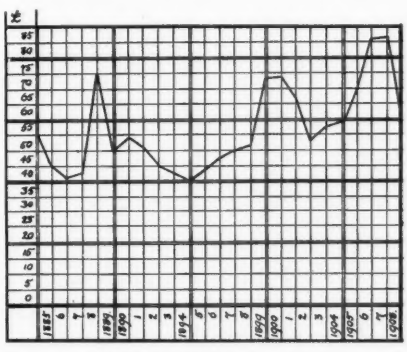


FIG. 2.—PRICE CHANGE IN COPPER, 1885-1908.

properties and methods of working are more fully grasped.

Many influences are therefore at work tending to keep the price of copper lower than in the past, and the buyer who takes full cognizance of these and shapes his policy accordingly, will save money and increase his profits.

Bills in Washington, D. C.

Representative Hardwick has introduced a bill to provide that within six months after the approval of his proposed measure every railroad in the United States engaged in interstate commerce would be compelled to adopt the telegraphic block system in the operation of all its trains, the size and location of the blocks to be under the supervision of the Interstate Commerce Commission; also to provide for the examination of all telegraph operators, and conferring upon the commission the power to prescribe reasonable hours of labor for all telegraph operators, their necessary qualifications, regulations, requirements and rules. A violation of any of the provisions would mean fines ranging from one to five thousand dollars, to be paid by the railroads.

Representative Douglas has introduced a bill to provide for the equipment of all ocean-going steamers carrying fifty or more passengers with an efficient radio-telegraphic apparatus, and a failure to comply would mean a liability to a fine of not more than $3,000 or imprisonment for not more than one year, or for both, unless it should be proved by the person so failing to make provision that there is a combination of the manufacturers of efficient radio-telegraphic apparatus to maintain prices. T.

Porto Bello Wireless.

The project for a wireless-telegraph station at Porto Bello, Panama Canal Zone, has been approved. The expense of building the station will be borne by the Isthmian Canal Commission, and the equipment will be furnished by the Navy Department. When the desirability of providing a means of quick communication between Porto Bello and the Canal Zone became apparent a telephone line was projected. It was found that the cost of installation alone would be about $15,000, and that the cost of maintenance would probably be very high. Investigation of the cost of a submarine cable was then made, and it was estimated that a cable would cost twice as much as a telephone line. The wireless station at Porto Bello will transmit messages to the wireless station at Colon, and from there will be transmitted to any part of the Canal Zone by telegraph or telephone. Communication with any station within reach will also be established. The cost of installation, including the buildings, will be about $7,000, and the cost of maintenance will be very low.

The American Electrochemical Society.

The fifteenth general meeting of the American Electrochemical Society will be held at Niagara Falls, Canada, May 6, 7 and 8. All the sessions will be held in the convention room of the Clifton Hotel, headquarters for registration and information being established in the writing room. The secretary of the association will be present on the afternoon and evening of May 5 and members arriving then can register. Members who will attend the banquet on Friday evening should purchase tickets when they register. It is necessary that all tickets be purchased not later than Thursday; subscription, $3.

Visits will be made to the plants of the following companies: Canada Niagara Power Company, Queen Victoria Park, Niagara Falls, Canada; Electrical Development Company, Ltd., Queen Victoria Park, Niagara Falls, Canada; Ontario Power Company, Queen Victoria Park, Niagara Falls, Canada; International Acheson Graphite Company, Niagara Falls, N. Y.; Niagara Falls Hydraulic Power and Manufacturing Company, Niagara Falls, N. Y.; Niagara Falls Power Company, Niagara Falls, N. Y.

On Saturday afternoon the members of the society will be admitted to the transformer station and cellhouse of the Development and Funding Company, where the Townsend electrolytic cell will be in operation.

A room will be provided at the hotel for an exhibit of electrochemical and electrometallurgical products and apparatus of special interest to the society.

Entertainment will be provided for the visiting ladies, Mrs. Edward Goodrich Acheson entertaining the ladies at a garden party at her home from four to six o'clock on Friday afternoon. On Friday morning there will be an automobile drive to Fort Niagara, and after a picnic luncheon the return journey will be made by Niagara-on-the-Lake.

The following programme has been announced:

THURSDAY, MAY 6—9:30 A. M.—Symposium on the Electrometallurgy of Iron and Steel.

"The Hèroult Electric Steel Furnace," Robert Turnbull, resident American engineer for Dr. P. L. T. Hèroult.

Paul Girod, director, S. A. Electrometallurgique Procédés Girod, Ugine, Savoie, France.

Dr. A. Kjellin, electrometallurgical engineer, Metallurgiska Patent Aktiebolag, Stockholm, Sweden.

Cav. Ernesto Stassano, director, Forni Ellectrici Stassano, Turin, Italy.

"Large Electric Steel Furnaces in the Iron and Steel Industry," Remo Catani, electrometallurgist of the Société Elba, Portoferraio, Elba, Italy.

"A Contribution to the Study of Electric Furnaces for the Electrothermic Treatment of Iron and Steel," Ch. A. Keller, general manager Société des Etablissements Keller-Leleux, Livet, Isère, France.

Gustav Gin, electrometallurgist, Société Procédés, Gin, Paris.

"The Present Value of Electric Steel," Henry D. Hibbard, consulting engineer, Plainfield, N. J.

"The Application of the Lash Process to the Electric Furnace," F. A. J. FitzGerald, consulting electrometallurgist, FitzGerald and Bennie, Niagara Falls.

"Electric Furnace Pig Iron in California," P. McC. Bennie, consulting metallurgist, Niagara Falls.

"The Electric Furnace Reduction of Iron Ore," Jos. W. Richards, professor of metallurgy, Lehigh University.

THURSDAY—2:45 P. M.—Continuation of Discussion on the Electrometallurgy of Iron and Steel. Reading of papers left over from morning session.

"Furnace Electrode Losses," C. A. Hansen.

"The Working Limit in Electrical Furnaces Due to the Pinch Phenomenon," Carl Hering.

"A New Type of Ammeter for the Accurate Measurement of Alternating Currents Above 1,000 Amperes," E. F. Northrup.

"A New Radiation Pyrometer," Charles E. Foster.

"The Automatic Registration of Temperatures," E. F. Northrup.

THURSDAY—8 P. M.—Presidential address, by the retiring president, E. G. Acheson. Subject, "The Electrochemist and the Conservation of Our National Resources."

9 p. m.—Smoker.

FRIDAY, MAY 7—9:30 A. M.—Meeting of board of directors, Clifton Hotel.

10:30 a. m.—Announcement of election of officers.

"Addition Agents in Electrolytic Plating Baths," E. F. Kern.

"Electrolytic Precipitation of Lead and Zinc as Affected by the Addition of Certain Organic Compounds," S. A. Tucker and E. G. Thomssen.

"Electrodeposition of Some Metals from Acetone Solution," H. E. Patten and W. R. Mott.

"The Deposition of Aluminium from Aqueous Solutions, Using Rotating Cathodes," S. A. Tucker and E. G. Thomssen.

"The Electrodeposition of Platinum," W. J. McCaughey.

"Electrolytic Production of White Lead and Colors," John A. Yunck.

"The Electromotive Force of Cadmium Amalgams," G. A. Hulett.

"Thermodynamics of the Weston Standard Cell," G. A. Hulett.

"The Electrolytic Reduction of Nitric Acid-II," H. E. Patten and W. J. McCaughey.

FRIDAY, 3 P. M.—Take special cars to the gate house of the Ontario Power Company; walk to the plant of the Electrical Development Company, Ltd.; walk to the Canadian Niagara Power Company, thence to entrance of the Ontario Power Company, from which point elevator will take visitors to power house in the gorge and to the transformer station at the top of the bluff.

7:30 p. m.—Banquet, Clifton Hotel.

SATURDAY, MAY 8—9:00 A. M.

"The Probable Electrical Nature of Chemical Energy," A. H. Patterson.

"Bakelite and Its Electrical and Electrochemical Applications," L. H. Baekeland.

"A Graphite Cathode Dish," J. W. Turrentine.

"Relative Efficiency of the Arc and Resistance Furnace for the Manufacture of Calcium Carbide," S. A. Tucker, W. A. Alexander and H. K. Hudson.

"Some Physical Properties of Silicon," C. I. Zimmerman.

"Magnetic Tests of Some Iron Alloys," C. F. Burgess.

"Further Experiments with Calcium Alloys as Reducing Agents," O. P. Watts and E. R. Suhm.

"Electrochemical Methods of Soil Analysis," F. K. Cameron.

"A Modified Oxy-Hydrogen Gas Coulometer," J. W. Turrentine.

"Rapid Electrochemical Analysis—a Comparison of Several Methods," L. S. Palmer and R. C. Palmer.

"An Answer to Professor Ganz's Questions on the Corrosion of Iron," W. H. Walker.

SATURDAY—2:30 P. M.—Take special cars at Clifton Hotel to plant of Development and Funding Company; thence take cars to plant of International Acheson Graphite Company; thence to power house of the Niagara Falls Power Company; thence take cars to Main Street and walk to the power house of the Niagara Falls Hydraulic Power and Manufacturing Company.

8:30 p. m.—The Niagara Club will tender the society and its guests an "open house" at the club house, corner of Buffalo Avenue and First Street, Niagara Falls, N. Y.

Manchester Section, Institution of Electrical Engineers.

The governing committee of the Manchester Section of the Institution of Electrical Engineers of Great Britain was elected at the annual general meeting on March 23 as follows:

Chairman, S. J. Watson; vice-chairman, J. S. Peck. Members—C. J. Beaver, Dr. F. H. Bowman, W. Cramp, A. A. Day, A. P. M. Fleming, A. C. Heap, G. Layton, V. A. H. McCowen, S. L. Pearce, Dr. E. Rosenberg, Prof. A. Schwartz, C. D. Taite, T. L. Miller, M. B. Field, Miles Walker.

Hon. secretary and treasurer, H. W. Wilson, 19 Brazennose Street; assistant secretary and treasurer, A. L. Green, 9 Churchill Avenue, Manley Park, Manchester.

American Iron and Steel Institute.

W. J. Filbert, secretary, has issued a notice stating that the second annual meeting of the American Iron and Steel Institute will be held May 3 at 12 o'clock noon, at 71 Broadway, New York city.

The directors of the institute have concluded that it will be advisable to defer holding the formal annual meeting until some date in the future, at which time it is contemplated an interesting and somewhat extensive programme will be provided. It is therefore proposed, unless the members of the institute should otherwise decide, to simply convene the annual meeting on May 3 and at once adjourn until a later date.

April Meeting of the Technical Publicity Association.

The monthly meeting of the Technical Publicity Association, which was held in New York city on April 8, marked the fourth year of its existence. This being the annual meeting of the association, reports were read by the officers and chairmen of the various committees.

The reports of the secretary and treasurer indicated that the association is in a healthy condition, both physically and financially. Not only is the membership larger than ever before, but it is constantly increasing. The association now numbers among its members the advertising men connected with the largest concerns in the United States, manufacturing machinery and allied products.

The report of the circulation committee showed that the association has on file reports from several hundred of the leading technical publications in the United States and Canada. These reports have been of considerable value to the members and are being constantly referred to. The reports of the committee on publicity, receptions and entertainments, showed good work being accomplished in these lines.

The election of officers for the ensuing year resulted in but few changes. The following were elected:

President, C. S. Redfield.
First vice-president, C. N. Manfred.
Second vice-president, O. C. Harn.
Secretary, H. H. Kress.
Treasurer, H. M. Davis.

Two additional members of executive committee and directors: Rodman Gilder, C. W. Beaver.

The subject of the meeting was "Trade Paper Copy," and a number of advertisements of the various members, clipped from the trade papers, were projected on a screen by means of a stereopticon, and were then criticized by the various speakers: Walter B. Snow, publicity engineer, Boston, on "The Text Matter;" Fred L. Dion, of the Willett's Press, New York, on "Typography;" George Leland Hunter, New York, on "Balance and Proportion in Display." Prizes of gold-mounted fountain pens were presented for the advertisments considered best as to text, typography and illustrations. Among others who contributed to the interesting topic of the evening were George French, editor of *Profitable Advertising,* and St. Elmo Lewis, advertising manager, Burroughs Adding Machine Company, Detroit, Mich.

The Next Census.

The provision for the taking of the new census, in so far as it applies to manufactures, provides, first, that it shall be taken next year, and every ten years thereafter.

The schedules relating to manufactures will have inquiries as to the name and location of each establishment; character of organization, whether individual, cooperative or other form; character of the business and the kind of goods manufactured; the amount of capital invested, the number of proprietors, firm members, copartners, stockholders, and officers and the amounts of their salaries; the number of employes and the amount of their wages; the quantity and cost of the materials used in manufactures, the amount of miscellaneous expense; the quantity and the value of the products; the time in operation during the census year; the quantity and character of the power used and the character and number of machines.

Inquiries will be confined to manufacturing establishments which were in active operation during all or a portion of the year ending December 31 next preceding the census year; and it will be confined to manufacturing establishments conducted under what is known as the factory system, and will be altogether exclusive of the neighborhood household and hand industries.

It will be the duty of those interested to answer all questions correctly, and any owner, president, secretary, director, or other officer or agent of any manufacturing establishment who shall refuse or neglect to answer or give false answers to any of the questions asked would be guilty of misdemeanor, and upon conviction would be liable to a fine of not exceeding $10,000 or imprisonment for a period of one year, or both, at the discretion of the courts. A. F. T.

Pittsburg Section, American Institute of Electrical Engineers.

The regular monthly meeting of the Pittsburg section of the American Institute of Electrical Engineers was held in Carnegie Institute, April 13, and was preceded by the usual dinner at the University Club. W. Edgar Reed presided.

The subject of the evening was "Repairing Live Lines While in Service," an original paper being prepared by J. S. Jenks, assisted by W. H. Acker, both of the West Penn Railways Company.

Mr. Jenks showed by means of a large number of lantern slides the system, together with the tools which he and his assistants have developed on their 25,000-volt lines in order to avoid the necessity for linemen to come in contact with the line conductors, and showed how completely equipped poles could be stripped of all wires and cross-arms and the insulators, cross-arms and conductors replaced without interrupting any circuit. The paper excited a lively interest among the body of engineers present, which included representative men from all the large electrical companies and public-service corporations in the territory. The discussion was participated in by H. N. Muller, D. E. Burke, W. H. Acker, N. W. Storer, A. J. Glenn, F. F. Espenschied, O. M. Jorsted, E. A. Calderwood, Graham Bright, R. A. L. Snyder and B. P. Rowe.

The next meeting of the section will be held on May 11 and a paper on electric lighting will be presented by C. E. Stephens, of the Westinghouse Electric and Manufacturing Company.

Boston Section, American Society of Mechanical Engineers.

A meeting was called on Friday evening, April 16, for the purpose of organizing a section of the American Society of Mechanical Engineers for members living in and near Boston, Mass. The meeting was largely attended, and in the absence of Prof. Ira N. Hollis was presided over by I. E. Moultrop. R. E. Curtis was chosen secretary of the meeting.

Jesse M. Smith, president, and Calvin W. Rice, secretary of the American Society of Mechanical Engineers, both enthusiastically endorsed the holding of meetings in Boston, and made it clear that no special organization or machinery would be required. It was the idea that all in the vicinity who might be interested in mechanical engineering should be welcome at the meetings, that all formal papers presented thereat should first receive the endorsement of the meetings committee of the National society, and should be published in the Proceedings prior to the meetings. A committee of five was appointed to take charge of the meetings for the balance of the year.

New York Electrical Society.

Owing to the unavoidable absence of Mr. Eastwood, who was to have presented a paper before the New York Electrical Society on Wednesday, April 21, the meeting was postponed. For the meeting of April 29 arrangements were made for a paper by B. A. Behrend, entitled "The Design and Characteristics of Modern Electric Machinery."

ALTERNATING CURRENTS AND THEIR APPLICATIONS.

BY EDSON R. WOLCOTT.

CHAPTER VIII. (PART III.)—POWER TRANSMISSION.

LIGHTNING ARRESTERS.

Horn-type arrester.—In the horn-type arrester, shown in Fig. 155, which is one of the oldest types, one limb is connected to ground and the other to line. The arc rises and becomes longer and longer and finally breaks. Sometimes a magnet is used underneath and the flame is forcibly repelled. A defect of this type of lightning arrester is that the arc, since it is a short-circuit of the line, is apt to persist for several seconds, during which time the arrester is likely to be completely destroyed. To limit the arcing some resistance is usually placed in series with the arrester. This detracts from its protective value, however.

FIG. 155.—HORN-GAP LIGHTNING ARRESTER.

The ideal type of protecting device for transmission lines would completely discharge the line of all electrical manifestations above the normal line potential independent of the frequency of the manifestation, the atmospherical conditions and any other disturbing influences. In practice, of course, this cannot be fully attained, but many devices have been developed and of these many are very effective.

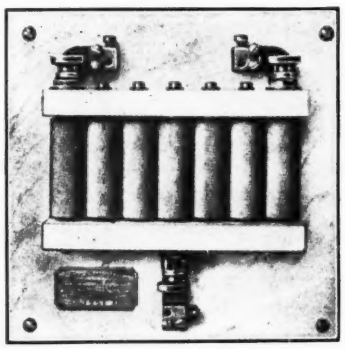


FIG. 156.—NON-ARCING STATION ARRESTER.

Non-arcing metal arresters.—For circuits not exceeding 2,500 volts the lightning arrester illustrated in Fig. 156 is designed. It consists of several independent cylinders of non-arcing metal placed with air gaps side by side on a marble base. They are knurled to present many points for the discharge. One of the end cylinders is connected to each line and the middle cylinder to the ground on two-wire circuits, with normal potential not exceeding 1,250 volts. When the potential is 2,500 volts the middle lead is not used and one arrester is connected between each line and the ground. Although the metallic cylinders are not far apart, an alternating current below the stated voltage does not maintain an arc between the cylinders when they are properly spaced, while they respond readily to a higher voltage.

The form shown in Fig. 156 is for use on switchboards, while the form for outdoor use is illustrated with the iron cover removed in Fig. 157. In this type the cylinders are partly incased in porcelain protectors.

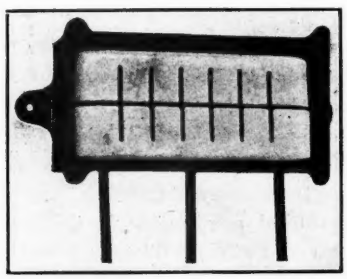


FIG. 157.—NON-ARCING LINE ARRESTER.

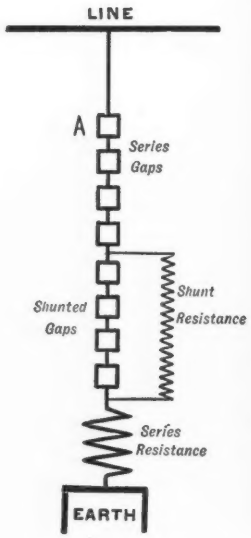


FIG. 158.—ARRANGEMENT OF MULTI-GAP ARRESTER.

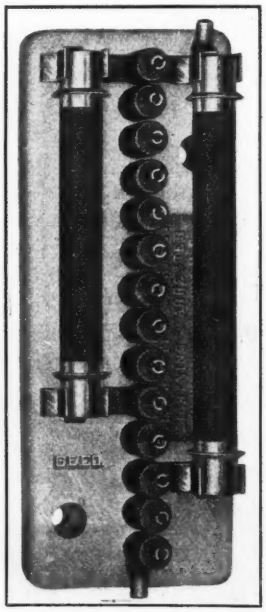


FIG. 159.—2,300-VOLT MULTI-GAP ARRESTER.

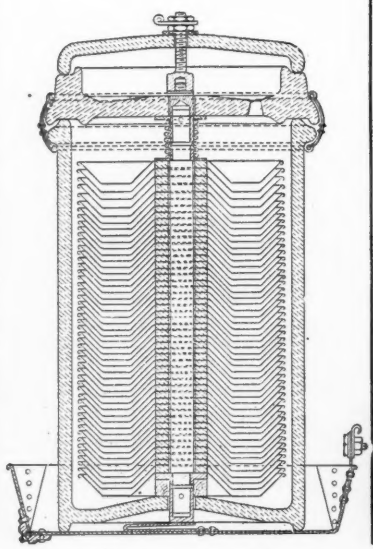


FIG. 160.—SECTION THROUGH ELECTROLYTIC LIGHTNING ARRESTER.

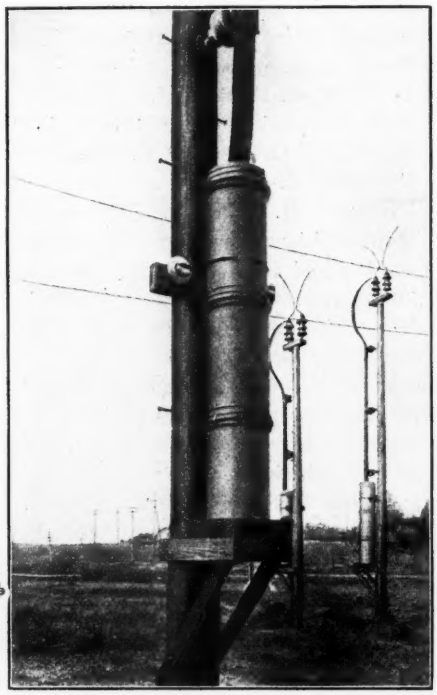


FIG. 161.—INSTALLATION OF ELECTROLYTIC LIGHTNING ARRESTERS.

Multi-gap arresters.—A more complex arrester, designed for use on a 6,000-volt circuit, is shown diagrammatically in Fig. 158. This is known as a low-equivalent

multi-gap lightning arrester. As shown it is a modification of the former, in which there are a number of air gaps connected to the transmission line in series with several shunted gaps and a resistance. A discharge occurs when the potential rises high enough to break down the series air gaps. If sufficiently heavy it passes over the shunted gaps also and to earth through the series resistance. The number of series gaps is just sufficient to withstand normal voltage and allow a proper factor of safety. Heavy discharges such as those due to lightning would take the path of the shunted air gaps rather than the shunt resistance. The function of the latter is to assist in suppressing the arc resulting from a heavy discharge by withdrawing it from the shunted gaps and reducing its current density. The small series resistance, which is non-inductive, limits the initial flow of current that follows the discharge and thus prevents the burning of the arrester cylinders between which are the air gaps.

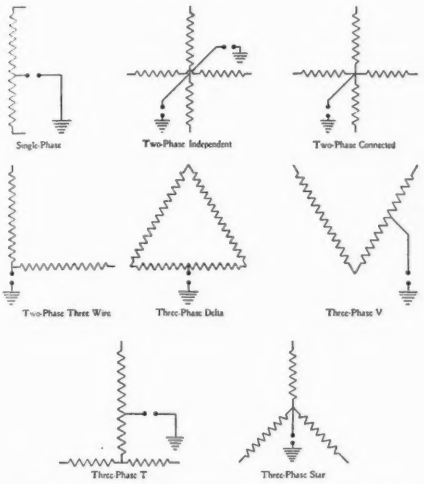


FIG. 162.—SPARK-GAP PROTECTION FOR VARIOUS TRANSFORMERS.

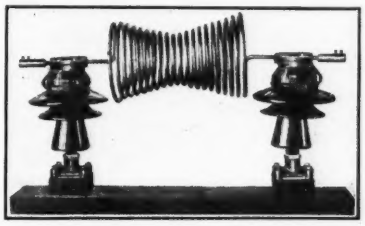


FIG. 163.—HIGH-TENSION CHOKE COIL.

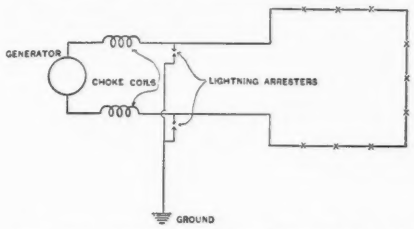


FIG. 164.—LIGHTNING PROTECTION FOR ARC-LIGHTING CIRCUIT.

Fig. 159 shows another type of multi-gap arrester designed for a 2,300-volt circuit. It consists of metallic cylinders having resistances (in the tubes) connected in parallel, as shown. In this type, however, no resistance is used in series. If the discharge is small it will follow the path containing a few air gaps and the larger resistance; if it is medium it will pass more air gaps and less resistance, and if very heavy, just the air gaps will be used.

Electrolytic lightning arrester.—When an electric current is passed through a cell containing aluminum electrodes and certain electrolytes, such as ammonium sulphate, a film is formed on the anode, which is the electrode where the current enters the solution and where oxygen is evolved. This film of oxide opposes the further flow of current unless the applied voltage be raised to such a value as to break it down. With an alternating current these films form on both electrodes as they alternately become anodes and cathodes. By arranging several of these cells in series the breaking-down voltage is proportionally increased until it is large enough to prevent any considerable flow of current from a transmission line under normal conditions, but permits the discharge of a current above the break-down

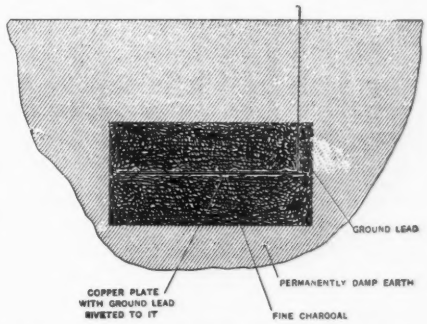


FIG. 165.—APPROVED GROUND CONNECTION.

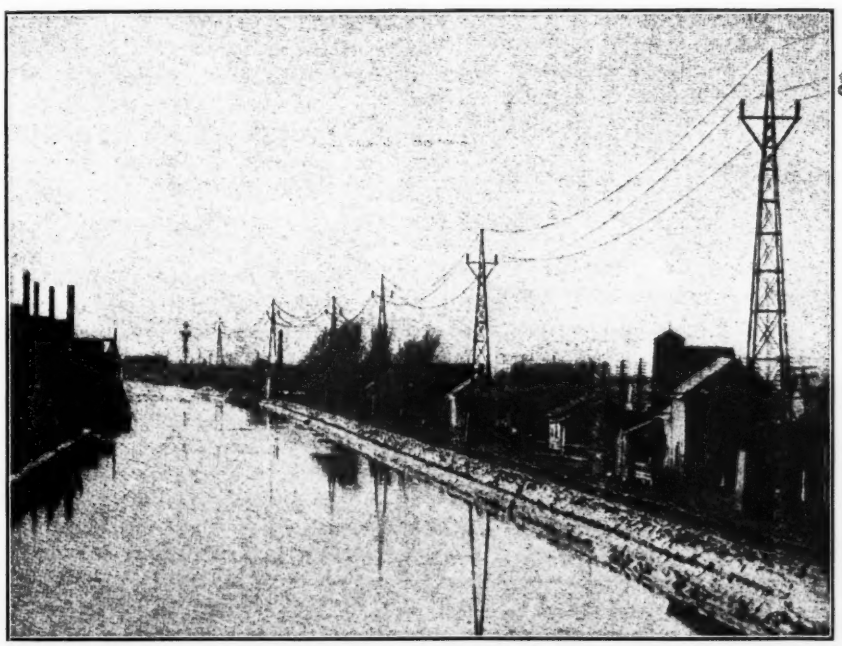


FIG. 166.—60,000-VOLT POLE LINE THROUGH SYRACUSE, N. Y.

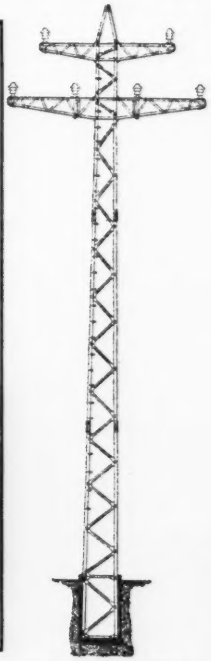


FIG. 167.—STEEL TOWERS FOR SANITARY DISTRICT.

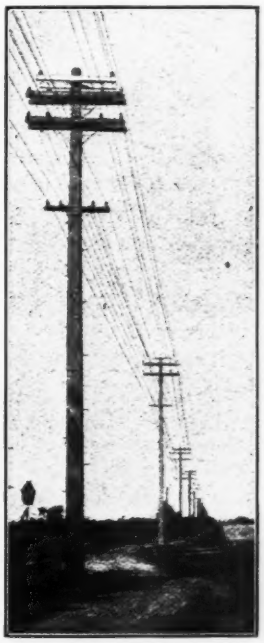


FIG. 168.—CONCRETE POLE LINE ALONG WELLAND CANAL.

voltage. An arrangement of this kind is illustrated in Fig. 160. The aluminum plates are pressed into the form of trays piled one above the other and separated from each by insulating washers, as shown. They are then enclosed in a stoneware jar and the electrolyte is poured into the first tray, fills it, overflows into the second, and so on until all are filled. The electrolyte fills only the trays and not the jar, as otherwise most of the trays would be cut out of service. There is a hole in the bottom of the jar for the excess electrolyte to pass out.

This type of arrester automatically repairs any puncture of the insulating film of oxide, due to the passage of a discharge. It is usually used in series with an air gap, one side of the arrester being grounded and the other side of the air gap connected to the line.

Fig. 161 is an illustration of this type of lightning arrester and the manner in which it is mounted and connected to the line. It will be noticed that the conductor connecting one terminal of the air gap and the electrolytic lightning arrester is in the shape of a broad band. High-frequency discharges, such as those usually damaging line wires, are conducted better by flat strips of metal than by wires. This is due to the fact that high-frequency currents tend to remain near the surface of conductors rather than penetrate them. This phenomenon is known as the "skin effect." This fact makes the opposition to the flow of a current greater for alternating than for direct currents and also greater the higher the frequency.

Use of grounded aerial wires.—A method of protection against lightning that is coming in vogue to a considerable extent is to stretch one or more grounded wires above the transmission line. Undoubtedly this does considerable good in shielding the line against direct and induced discharges. It is a well-known fact that a body within a hollow metallic body and insulated therefrom receives no charge, since the charge resides upon the surface. So the ground wire or wires strung above the transmission line act as a protection to a certain extent.

Protection of low-tension side of transformer.—High-tension disturbances sometimes appear on the low-tension side of transformers connected to high-tension transmission lines. These momentary increases in potential are due to the inductive action of electrical surges on the high-tension side and are called "static disturbances." To obviate these difficulties, grounded discharge spark gaps are usually connected to the middle point of the low-tension side of the transformer, as shown in Fig. 162. The opening of the spark gap is of just such an amount as to prevent any discharge under normal conditions and to carry away the static disturbances.

Choke coils.—A choke coil is often connected in the line between the apparatus and the arrester. This increases the inductance of the line and prevents, to a certain extent, sudden rushes of current; it also tends to throw any electrical surges away from the apparatus and through the arrester circuit. These coils must be well insulated to withstand sudden electrical shocks. Fig. 163 shows a type of choke coil for use on high-voltage circuits where only a small inductance is preferable. A method of connecting lightning arresters and choke coils in an arc-lighting circuit is illustrated in Fig. 164.

Grounds.—In all arrangements for protection of high-tension transmission lines the ground connections are of the utmost importance. It is not always sufficient to connect the ground leads to a pipe driven into earth. A method of obtaining a reliable ground connection is illustrated in Fig. 165.

LINE CONSTRUCTION.

The subject of transmission-line construction is so broad that it can be merely touched on here. Steel towers have a life of about three times that of wooden poles, but, of course, cost more. In general they are preferable for permanent transmission lines, except in certain parts of the country where pole timber is abundant.

Fig. 166 illustrates a 60,000-volt transmission line passing through the city of Syracuse, N. Y. The towers are forty to sixty feet high; the spans are from 350 feet to 450 feet; the conductor spacing is six feet. Fig. 167 illustrates the steel towers erected by the Sanitary District of Chicago. They carry two three-phase systems at 45,000 volts. The height is forty-five feet, the average span about 400 feet, and they weigh about 4,000 pounds each.

Concrete poles, molded in horizontal wood troughs with the cross-arm bolt holes and iron steps imbedded therein while soft, are used on the Welland Canal line, as illustrated in Fig. 168. They are from thirty-five to seventy-five feet high and carry two three-phase circuits at 40,000 volts. It is said that in many cases concrete poles can be constructed cheaper than steel towers. Fig. 169 is an illustration of a steel tower designed for suspension insulators.

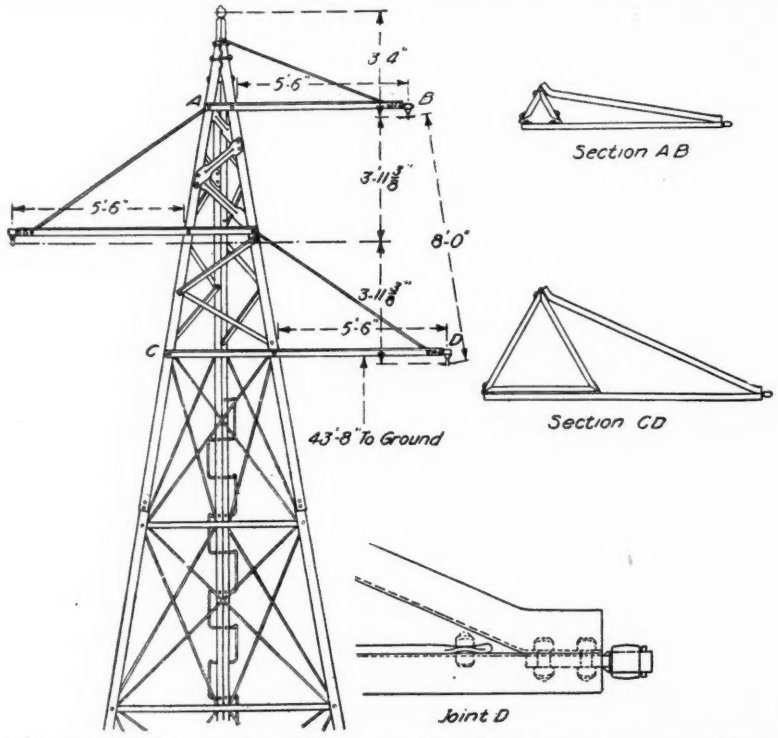


FIG. 169.—DESIGN OF STEEL TOWER FOR LINE WITH SUSPENSION INSULATORS.

Saskatchewan Government Buys Telephone Lines.

The Saskatchewan government has purchased all of the long-distance lines, local exchanges and equipment of the Bell Telephone Company in the province, taking over the system May 1.

Electrical Show and Conventions at Cedar Rapids, Iowa.

What was universally acknowledged to be the biggest and best exhibition of any kind ever held in the city of Cedar Rapids, Iowa, was held at the American Auditorium on April 21-23, when the Iowa Electrical Association and the Iowa Street and Interurban Railway Association held a joint electrical show in connection with their ninth and sixth annual conventions, respectively. The exhibitors were so enthusiastic over the splendid treatment they received that they decided to extend their part of the show to a length of three days instead of two as originally intended, and as a further token of their appreciation the gentlemen in charge of the exhibits spontaneously presented W. N. Keiser, the secretary of the Iowa Electrical Association, with a fine gold watch. Mr. Keiser in replying to the presentation said that the Iowa Electrical Association always endeavored to treat the electrical trade representatives as guests rather than as legitimate prey.

Mr. Mathes, the retiring president of the association, was also rewarded for his earnest work, the members of the association making him a present of a very handsome solid gold watch fob.

The electrical show was visited by thousands of people, who were greatly interested in the numerous electrical devices that were being demonstrated. The exhibit that probably attracted the most attention was an electrically-driven sewing machine exhibited by the Westinghouse Electric and Manufacturing Company. This consisted of a special motor attached to an ordinary sewing machine of standard make and controlled entirely by the foot treadle, the adjustment being so fine that single stitches could be made with ease.

The Hobart Electric Manufacturing Company of Des Moines, Iowa, had a very interesting exhibit of electric coffee mills, and the demonstrator was constantly surrounded by very interested members of the grocery trade while he exhibited the perfect acting of his machinery. Electric incubators, vacuum cleaners, laundry machinery, flatirons, toasters, broilers, glue-pots, chocolate warmers for candy factories, and numerous other devices of a like nature were on show and attracted their share of public attention. Exhibitors of electric vibrators and massaging machines were kept busy giving practical demonstrations to the visitors. Other interesting exhibits were a miniature working model of an electric-car system with a perfect automatic block system, stop-gates, etc., a full-size working model of a trolley retriever and an automatic electric car-signaling device.

THE NINTH ANNUAL CONVENTION OF THE IOWA ELECTRICAL ASSOCIATION.

The ninth annual convention of the Iowa Electrical Association was held at the American Auditorium, Cedar Rapids, Iowa, April 21 and 22. The president, L. D. Mathes of Dubuque, Iowa, called the convention to order at 10:30 a. m. on Wednesday, April 21. An address of welcome was read by Hon. J. T. Carmody, mayor of Cedar Rapids, which was replied to by Judge Hanlon in the absence of P. B. Sawyer of Des Moines, who was slated to give the response.

The hall was packed to overflowing when the president arose to deliver his address, several ladies being present in the audience. The following extracts are taken from Mr. Mathes' address:

"The past year has been more eventful to the electrical interests of this state than the majority of you have realized. The past twelve months have proved the value of the manufacturer's claims for the tungsten lamp, with the result that all doubt and uncertainty on the part of those interested have been overcome, and the latest evolution in the incandescent lighting industry has been generally and almost universally adopted by progressive electrical men.

"We have seen a marked improvement in the entire line of heating units, and the central stations are now in a position to add largely to their revenue through channels which a few years ago were practically non-existent.

"There have been many instances within the last year in this state where the aspirants for public office have gone before the people on the platform of what they would do to the corporations if elected to office. In some cases those elected have endeavored to make good their pledges to the extent of attacking the corporations indiscriminately, while in others they have conveniently permitted this plank in their platform to fade from memory; but in my opinion we are approaching a change of sentiment on the part of the people at large. The people are beginning to realize that the corporations are not a band of crooks and highwaymen, whose sole reason for existence is in plundering their customers, and many evidences are coming to notice of fair play for utility companies. You may have noted that an attack was made on your interests to the effect that the corporations of this state were maintaining a lobby at Des Moines for the purpose of influencing legislation. This I can say to you is buncombe. Representatives of the electrical industries did go to Des Moines on many occasions in their own interests, but only with the purpose of protecting those interests when they were being outrageously assailed. This is a duty not only to ourselves but to the thousands of individuals who have shown their confidence in us by purchasing our securities.

With respect to the issue raised at the last session for the proposed creation of a Capital Service Commission, Mr. Mathes averred that the best feature of such a commission is that it should be selected by the governor from the highest type of individuals so as to remove the corporations entirely from the influence of local politics.

"The past year has been one of reasonable prosperity for the electrical industry in spite of the recent financial depression. With the lessening of the output by our factories the country over and the inclination to curtail expenses of every character, we cannot but expect that the patrons of our companies will proceed cautiously along every line of expenditure. This state of affairs has been beneficial to the lighting industry, inasmuch as it has forced us to recognize the fact that it was necessary to retain customers on our books and to secure additional customers, to cultivate the highest efficiency of the art of illumination and the application of power."

In conclusion Mr. Mathes thanked the members of the Iowa Electrical Association for the honor in electing him as their president, and said further that the association is recognized the country over as a body of active, earnest men, and that no individual can be connected with it in any way without being the gainer thereby.

REPORTS.

Following the president's address were the reports of the committees. Mr. Burt, of the Facts and Factors Committee, presented its report. Mr. Burt's address was a discussion of the tabulated statement reproduced on page 791, which was made up from twenty-five replies from 117 central-station men who had been written to for the information contained in the table. The table was made up at the suggestion of J. R. Cravath of Chicago, and it is probable that the showing of the stations which reported is above the average on account of the small percentage of replies

received. In the discussion that followed the president was told by Mr. Burt in answer to a question that two-and-one-half hours a day was a fair average service for incandescent lights in towns of over 2,000 population, and remarked thereupon that from his own experience a flat rate for four hours a day was very good business. A general discussion followed.

The report of the Committee on Grounded Secondaries was postponed until the afternoon session and that of the Membership Committee to the executive session. The election of a Nominating Committee followed. Messrs. Stearns, Burt, Harris, Ferris and Lundgren were elected. J. G. Boyd, of the Columbia Incandescent Lamp Company, then occupied the floor with an exhortation to the members to join the Sons of Jove, hitherto not represented in Iowa. After the convention "Rejuvenation" meetings of the Sons of Jove were held, and many of the principal electrical men present joined the order.

	Total Population.	Station Capacity, Kilowatts.	Investment per Kilowatt Station Capacity.	Gross Annual Income per Kilowatt Station Capacity.	Gross Annual Income per $100 Invested.	Ratio of Expense to Gross Income, Per Cent.	Operating Expense per $100 Invested.	Annual Income per Consumer.	Total Connected Load per Kilowatt of Station Capacity, Kilowatts.	Lamp Load per Kilowatt of Station Capacity, Kilowatts.	Motor Load per Kilowatt of Station Capacity, Kilowatts.	Heat and Miscellaneous Load per Kilowatt of Station Capacity, Kilowatts.	Ratio Transformers to Station Capacity, Kilowatts.	Station Capacity per Employe, Kilowatts.	Yearly Load Factor, Per Cent.	Income per Capita.	Investment per Capita.	Station Capacity per Capita, Watts.	Number of Consumers per 100 of Population.
A	1,100	45	$244	$81	$33	80	$26	$26	0.7	0.7	0	0	1.2	23	32	$3.30	$10	41	12
B	1,200	50	370	93	25	75	19	39	2.5	2.4	0.1	0	...	25	22	3.90	15	42	10
C	1,400	48	250	114	45	65	30	43	...	...	...	...	...	24	46	3.90	9	29	9
D	1,500	100	200	90	45	72	33	67	1.8	1.5	0.2	0.1	...	25	21	6.00	13	67	9
E	1,500	60	192	..	..	..	..	..	...	...	...	...	1.0	29	..	....	8	40	7
F	1,500	60	200	88	44	76	33	29	1.5	1.3	0.2	...	...	30	..	3.50	8	40	12
G	1,800	75	300	103	34	83	28	42	0.6	0.6	0	...	0.1	19	50	4.30	13	42	10
H	2,000	120	208	70	34	36	12	37	1.7	1.7	0	...	1.7	40	47	4.20	13	60	11
I	2,000	53	260	111	43	81	34	27	1.1	1.1	0	...	1.1	27	..	2.90	7	27	11
J	2,000	60	133	..	..	64	..	25	0.8	0.8	0	....	....	30	..	....	4	30	..
Average	1,600	67	236	94	38	70	27	37	1.3	1.3	0.06	0.03	1.0	27	36	4.00	10	42	10
K	2,200	75	292	137	47	62	29	40	2.8	2.3	0.4	0.1	0.7	37	91	4.60	10	34	12
L	2,500	80	187	69	37	73	26	40	1.3	1.3	0	...	...	40	45	2.20	6	32	6
M	2,500	130	138	..	..	72	..	44	2.1	2.1	0	0	....	..	..	....	7	52	..
N	2,700	110	218	94	43	79	34	36	2.5	1.6	0.5	0.4	1.2	37	24	3.80	9	41	11
O	2,800	135	200	67	32	72	23	38	2.7	2.2	0	0.5	0.9	34	24	3.20	9	48	12
P	3,000	175	200	101	51	53	27	65	1.3	1.3	0	0	1.2	29	23	5.90	11	58	9
Q	3,000	150	167	67	40	..	..	33	1.2	1.2	0	0	D. C.	50	..	3.30	8	50	10
R	3,000	120	367	132	36	32	12	50	2.9	1.8	0.8	0.3	1.3	40	25	3.30	15	40	10
Average	2,710	122	221	95	41	63	25	43	2.1	1.7	0.2	0.2	1.1	38	39	3.80	9	44	10
S	4,000	250	126	106	85	43	37	59	2.2	1.2	0.9	0.1	1.2	42	23	6.70	8	63	11
T	5,000	255	216	71	33	67	22	33	1.9	1.4	0.3	0.2	1.8	32	15	3.60	11	51	11
U	8,000	300	266	78	29	59	17	33	1.9	1.6	0.3	...	...	38	21	3.00	10	38	9
Average	5,670	268	203	85	49	56	25	42	2.0	1.4	0.5	0.15	1.5	37	20	4.43	10	51	10
V	15,000	900	139	75	54	53	29	63	1.9	1.4	0.5	...	0.8	50	16	4.50	8	60	7
W	16,000	650	...	46	..	90	..	57	1.1	0.7	0.4	0.1	0.8	93	29	1.90	..	41	3
Average	15,500	775	139	60	54	71	29	60	1.5	1.0	0.5	0.1	0.8	71	22	3.20	8	50	5
X	28,000	2,100	190	58	30	42	15	56	1.6	0.9	0.6	0.1	0.8	233	30	4.30	14	75	8
Y	46,000	1,000	200	109	55	57	31	85	2.9	1.7	1.0	0.2	1.2	125	17	2.30	4	22	3
Z	85,000	3,250	...	99	..	54	..	97	2.8	1.6	1.1	0.1	0.4	427	24	3.80	..	41	4
Average	53,000	2,120	195	89	42	51	23	79	2.4	1.4	0.9	0.1	0.8	262	24	3.50	9	46	5

THE PORTABLE VACUUM CLEANER.

The first paper was read by O. E. Brownell of Lake City on "The Portable Vacuum Cleaner." Mr. Brownell related his experiences with a small portable machine which he obtained on thirty days' trial, and which he made known that he wished to place for one evening each in the different residences in his vicinity. Owing to the fact that his company does not have day power the machine had to be used evenings, which was, of course, a disadvantage. The rental charged for the use of the machine was seventy-five cents per evening. He does not consider this entirely equitable, and is now perfecting a timing device and will soon establish a minimum charge and sliding-scale rates per hour for the use of the machine. The cleaner was used very liberally by many of the best housekeepers in his city to do their regular sweeping. Most of the praise of the work of the machine came from its use on plush upholstered furniture. The author discussed the different makes of machine which have been on exhibition, and commented on the fact that a light suction will work better than a more perfect vacuum, which is liable to remove not only the dirt from the carpets, etc., but also the thread and nap. His own personal observations led him to believe that the vacuum-cleaning idea had been exploited extravagantly by unscrupulous manufacturers and enthusiasts. A vacuum cleaner will remove loose dust and dirt efficiently, but it will not remove caked mud, renovate faded wall paper, or clean window curtains as if they had come from the laundry. He allowed that the use of vacuum cleaners would have a very rapid growth in the future, and that while the financial results attained in his experience have been entirely satisfactory, he does not place as much value on this feature as on the fact that it is one more stride in popularizing the use of electricity in the home.

The discussion on this paper, which was very animated and somewhat prolonged, was opened by the president, who emphasized especially the closing words of Mr. Brownell, and said that if a woman uses an electric vacuum cleaner it would pave the way to the introduction of other electrical devices in the household, a subject in which they were all vitally interested. Other members followed with experiences very similar to those of the author of the paper.

J. T. Moffit of Tipton said that every central-station man should have electric vacuum cleaners for hire. In telling of his experiences with these machines he said that if any complaints were made he allowed rebates claimed, as for non-use of the machine for the full time, etc., a broad-gauge policy which the president heartily commended.

Mr. Burt of Waterloo suggested a portable-battery outfit for houses not wired, and the president recommended that an experienced mechanic should be sent around with hired-out machines rather than trust them to the mercies of inexperienced housewives.

Following the general discussion the privilege of the floor was accorded to the members of the trades who were present. Mr. Wilkinson of St. Louis suggested that $5 a day was a more equitable price than those mentioned by previous speakers.

Later he supplemented this with the services of a competent attendant, although some of the later machines of his firm were practically foolproof and could be trusted in the hands of inexperienced housewives. Mr. Streeter of Lincoln advised expansion in this line of business. In his home town he had thirty-two machines which were in use practically all the time, being rented out to central-station men and others. He suggested a charge of five cents a square yard for rugs and carpets, or fifty cents an hour.

The president, in concluding the discussion, said that the experimental time for electrical household devices had passed. Business men had paid for their experience and now wanted a thorough investigation before they put their money into anything. Many thousands of dollars had been lost by central-station men in buying back guaranteed electrical devices now obsolete. This broad-gauge policy, he said, establishes confidence between the seller and the buyer or consumer.

AFTERNOON SESSION.

The afternoon session was opened by the report by S. A. Fish of Ames, of the Committee on Grounded Secondaries. This report consisted in reading various letters and papers on the subject by external authorities, as the committee had been unable to make tests, owing to the lack of funds. One of the papers read was that of J. L. R. Hayden, which appeared in the Proceedings of the American Institute of Electrical Engineers in March, 1908.

In the discussion that followed Professor Ford suggested a hitherto unused method of grounding secondaries, which consisted of a posthole about two feet deep filled with charcoal and having an iron pipe driven vertically in the middle of it. The pipe when rusted could be replaced by a new pipe or rendered fit for further service by driving it further in. The president remarked that the suggestion had the ring of much merit and recommended that it be tried out. It was stated that funds have now been secured for experiments on grounded secondaries, and it was moved and carried that the report be continued at the next annual meeting.

DOMESTIC APPLICATIONS OF ELECTRICITY.

This was followed by Mrs. L. D. Mathes of Dubuque with a paper entitled "Application of Electricity in the Modern Home." In commencing her paper Mrs. Mathes said that woman was naturally more conservative than man in many respects, and has hitherto been slow to avail herself of the marvelous labor-saving devices which would lighten and brighten her lot. It was necessary to educate the modern housekeeper to an appreciation of the efforts that science and invention were making in her behalf.

She instanced several of the courses of instruction that were open to housekeepers in and about her neighborhood. Sources of intercommunication afforded by these courses among women interested in the subject of labor-saving appliances and also by means of clubs and other organizations should be encouraged to the utmost, and indeed are being used very largely at the present time. Mrs. Mathes noted that the Cleveland Electric Illuminating Company maintains a well-appointed salesroom where samples of the newest and best electrical devices for use in the home are ably demonstrated. This enterprising company has catchy window demonstrations, sends solicitors for entire cooking outfits at very attractive figures among the people, has a demonstrator call at the houses where these are installed to show how they work, and has a wireman who inspects the apparatus once a fortnight to keep it in working order and demonstrate to the users how to make simple repairs.

During the course of her paper the authoress gave a practical demonstration of an electric oven which she had had fitted with a glass door so that the audience and herself could read the thermometer during the cooking of a roast. The reading of the thermometer was practically constant at about 400 degrees during the entire operation. She also exhibited a fireless cooker, partly designed by herself, which has proved successful.

At the close of her paper Mrs. Mathes was presented with a bouquet of roses by Mr. Keiser as a mark of appreciation from the members. Mrs. Mathes replied in a neat little speech and took the opportunity to berate the St. Louis man for charging such a high price as $5 a day for the use of a vacuum cleaner. Careful housecleaners, Mrs. Mathes said, would use the machine at least once every few days and not only at spring cleaning times, and the high price was prohibitive.

In reply to a question by Mr. Burt, Mrs. Mathes said that the electric oven was incomparably better than a gas oven, as there was no bad odor connected with the use of electricity, and the distribution of the heat was much better. The electric oven, moreover, was self-basting, and from every hygienic standpoint was superior to the other.

In the subsequent discussion the cost of working with an electric oven was brought up, and it was admitted that the gas oven at present was a little cheaper, although the president asserted that at a rate of two-and-one-half cents a kilowatt-hour the costs would be about equal with gas at $1 a thousand cubic feet.

TUNGSTEN LAMPS.

Thomas Ferris of Osage followed with a paper on "The Effect on Central-Station Revenues Through the Introduction of the Tungsten Lamp." The author started out with the assertion that the tungsten lamp is certainly the best development of incandescent lighting that has been offered to the electric-light trade up to the present time, and with properly fitted shades or reflectors to suit various conditions it is the most ideal system of artificial lighting for general illuminating purposes so far discovered.

Its effect on central-station revenues is a question that deserves considerable study, especially from the viewpoint of the small station which has not enough business to warrant running a day service. The tungsten lamp takes less current and gives better service to the consumer for less money than the carbon lamp, and it is therefore necessary to secure additional outside business to make up for the consequent loss of revenue on fixed installations designed for service with other kinds of lamps. The small stations which cannot afford to run a day service are handicapped when compared to the larger stations which run a twenty-four-hour service and gain much revenue from the use of motors, fans, flatirons, toasters, chafing dishes, coffee percolators and such like. Customers who now use tungsten lamps, in consequence of the reduction in their lighting bills, feel that they can afford to use more of these electric devices than before, and would install them. The author suggested several reasons why the tungsten lamp should ultimately increase the central-station revenue by supplying more than enough new business necessary to replace the old which is lost. By reason of the greater amount and the better quality of light which it will produce for less cost to the consumer, it will enable a great many people to use electric light who otherwise would not feel they could afford to do so.

A paper by D. F. Fradette, of Des Moines, entitled, "Ornamental Curb Line Illumination," followed. Mr. Fradette gave a very interesting account of the efforts put forth in Des Moines to elec-

trically illuminate the town with a due regard to the artistic features of the installation.

THURSDAY MORNING SESSION.

The Thursday morning session was opened by M. A. Harrison, of Nevada, Iowa, with a paper entitled "Twenty-four-Hour Service in a Town of 2,500 People, and Methods Adopted to Increase the Daylight Load." Mr. Harrison said that local conditions must in every case govern the amount of business available, and that there were but few towns of 2,000 population and upward that cannot increase the sales of current sufficiently to cover the increased cost of making the daylight run. Waterworks, printing offices, blacksmith shops, laundries, machine and repair shops, plumbing shops, elevators and the like require power, and these with the various domestic uses of current and an increased amount of lighting should make up sufficient business to justify the twenty-four-hour run. Most of the daylight business can be operated with the present equipment, as most of the power business obtained will be of such a nature that it will not come on during the lighting load. The fixed charges would be no greater on a plant operating twenty-four hours than on one operating twelve hours. Therefore the items of fuel, labor and station supplies are all that would be increased, with the exception of a slight increase of depreciation of plant.

In the discussion that followed, Mr. Moffit suggested that plants which cannot be run for twenty-four hours might reasonably make a profit on seventeen or eighteen hours' run. His own plant ran from 5 a. m. to 12 p. m. in the winter and from 7 a. m. to 12 p. m. in the summer, and shut down an hour at noon. The plan was eminently successful.

Morgan P. Ellis, of New York, read a paper entitled "Aid of Prismatic Reflector to High Efficiency Units." Mr. Ellis' paper was a dissertation on the merits of the Holophane prismatic reflector. In November, 1908, the Holophane Company made some sweeping changes in their high-efficiency glass, having in mind the fact that the bowl-type reflector which successfully hides the intense brilliancy of the unit could be so calculated as to give any one of the three distributions required by illuminating engineers in their work; namely, the extensive, intensive and focusing type of distribution. In this new line of reflectors the merging prism has been utilized as it adds to the reflecting powers as well as to the beauty of the reflector.

The question of dust-catching was brought up and Mr. Ellis made an able defense for his product. In conclusion he emphasized the fact that much care should be taken in obtaining the proper distribution from the light source in order to raise the standard of illumination.

Following Mr. Ellis' paper was a discussion led by E. J. Callahan, of the Chicago office of the General Electric Company, on the progress of the introduction of heating units by central-station companies. Mr. Callahan saw great progress in introducing heating units. He said that a single flatiron in a residence probably meant more revenue than the lighting of the whole house. Conventions such as this pointed out to manufacturers of electrical devices what is needed. Two things were needed to be taken into account in considering electric appliances, and these were durability and price. The latter could be kept within reasonable limits by a proper co-operation in buying and advertising. Mr. Callahan recommended displays in drug stores and public places and a proper attention to the distribution of electrical devices.

In the course of a discussion with the president Mr. Callahan said that the present year's business would be an increase of fifty per cent over last year's, and in five years' time he estimates an increase of 1,000 per cent. He prophesied that in a few months a new fireless oven will be introduced to take forty per cent of the power at present used. He said that flatirons, toasters, and percolators, and especially the first two, were the principal electric heating units now in use.

A SUCCESSFUL SIGN CAMPAIGN.

The afternoon session was opened by J. B. Lindl, of Dubuque, with a paper on "The Story of a Successful Sign Campaign." Mr. Lindl related the story of a successful sign campaign conducted by the Union Electric Company in the city of Dubuque. The first step taken to popularize electric-sign advertising was to enter into negotiations with the two daily papers for an advertising exchange proposition by offering to erect an electric sign on the office of each and to furnish current for operating same at the regular sign rate in exchange for advertising space at the regular rates in the papers. The cost of the sign was added to the cost of current to operate same on a flat rate from dusk to 10 p. m. each night for one year, and the total divided into twelve equal installments, a bill for each of which was rendered each month. The papers in turn rendered a bill for advertising each month, which was paid for by the company, thus putting the matter on a cash basis and avoiding confusion in the account. The newspaper advertisements made clever appeals to the business men of the city by reference to the fact that newspaper men know good advertising when they see it, and that if electrical sign advertising was good for them it was good for other people. This offered a fine talking point in soliciting. A further advantage was that the newspapers who had from $200 to $300 apiece invested in the signs would not be likely to support any movement toward a restrictive legislation by the City Council on the matter of signs.

Circular letters were mailed to the big business houses showing them the worth of electric-sign advertising in reaching a large number of people at a very small cost, and at a time when their minds were not occupied with other things, as they might be when in their homes or offices glancing over the daily paper. Several inquiries came in from this and four orders for signs were closed as an immediate result. The method employed was to sell advertising and not signs, and the efforts of the company were to show the merchant how many people he would be likely to reach with so many dollars' worth of electric-sign advertising as compared with the same number of dollars' worth of newspaper advertising, with the credit greatly in favor of the former. The method of payment was the twelve monthly-installment system adopted in the case of the newspaper signs.

After several signs had been erected, another circular letter was sent out drawing attention to the four most progressive and up-to-date merchants and the valuable advertising they were getting out of their electric signs. As no merchant wants to be called a back-number, this brought in another lot of inquiries, and from that time on the company was able to close all the way from one to three signs a week on an average.

About this time a movement was started in the papers to boost Dubuque. The company took advantage of this by embodying in its advertising the fact that nothing could be more of a boost to the city than to have the main street so well illuminated with electric signs that it could be comparable with "The Great White Way" of New York.

After a while, in order to infuse a little

variation into the style of the signs, the company entered into an agreement with the Federal Electric Company of Chicago whereby they agreed to sell signs to prospects in Dubuque at a discount of thirty-three-and-one-third per cent off their list. Mr. Lindl's company in turn paid the Federal company for the signs at forty per cent discount, thus leaving the difference between the two discounts to cover freight, cartage, etc., and then gave the customer the same kind of payment as previously. This put new life into the sign business, as the Federal Electric Company sent a salesman to canvass the city, with the result that in three weeks nineteen signs were sold, bringing in a revenue of over $1,300 per year.

F. H. Welling, of Chicago, described another scheme, which was one on a rental basis, in which all the costs can be added and paid for at so much a week—this for a case in which the sign when taken back can be used over again, which will not do for special signs.

E. M. Stearns, of Humboldt, read a paper on "Selling Electrical Domestic Appliances in a Small Town." Mr. Stearns' remarks consisted of an account of his efforts to provide business for a day load in Humboldt, a town of 2,000 inhabitants. He concluded that the best way was to popularize electric domestic appliances. He secured samples of all the articles along this line he had seen advertised, and started in to dispose of the same. Circular letters failed utterly, so he told his solicitors to take out four dozen electric flatirons and leave them in every home where they could, with the understanding that the people keep the iron for a month on trial, and at the end of this time if they did not care to buy the irons would be taken back without charge. Only two came back, and this line of operation was followed until all prospects were supplied. Electric fans were started in the same way, also washing machines, etc. Mr. Stearns suggested that the most satisfactory way to start the sale of washing machines is to have the merchant who handles such machines put one in his window on display. Let him sell the machine and realize the profits on the same, without cost to him. The same methods will work out with the sewing-machine motor, which motor can also be used to advantage by many people for various purposes.

The author emphasized most strongly the fact that it was a great mistake to sell these articles at a big profit. The central-station man was looking for a market for his electric power, and not for profits on supplies.

Chafing-dishes, percolators and small grids were easy to dispose of to replace alcohol burners. Mr. Stearns recommended his hearers to interest the druggists to stock the electrical heating pad to replace the hot-water bottle, and to get the doctors to boost them. He told

O. E. BROWNELL,
President Iowa Electrical Association.

of the efforts of the manufacturers, who would supply lady demonstrators, at small expense, to work in co-operation with central stations, in building up business in electric utensils of various kinds. The most difficult thing was to place his articles before the people. After this has been accomplished, providing the articles have intrinsic merit, the extension of their use should not be very difficult, as one

W. N. KEISER,
Secretary Iowa Electrical Association.

woman would not want to be beaten by another, and would want to get what her neighbor had.

The next item was a discussion, by W. J. Greene, of Cedar Rapids, on "The Importance of Close Inspection of Customers' Installation." This was a short paper on the prevention of fire risk from electric origin. Mr. Greene emphasized the necessity for inspection and testing of new connections. It was a good plan for companies to make an independent test rather than trust entirely to official municipal inspectors. Deterioration in wiring could be detected by periodical inspection and testing. Mr. Greene proposed that the association appoint a committee to investigate and ascertain whether any companies have made, or now make, a practice of periodical tests, and what results have been obtained therefrom, or in case no data are available, to prove or disprove the effectiveness of periodical testing, that the committee formulate instructions for testing, and prepare forms for a report, and request their company to test and inspect their consumers' installations within the next few months and report results, giving the cost of making the tests and inspections. This was immediately moved and carried, and the chair appointed Mr. Greene and Mr. Ferris on the committee, the information to be secured by correspondence.

The last number on the programme was a twenty-minute talk, "Does It Pay the Central Station to Be Broad-Gauged in Dealing with Its Customers?" by the president. The president said that as so much discussion had indirectly covered this, he would not follow out this part of the programme.

At the executive session, which wound up the convention, the following officers were elected for next year:

President, O. E. Brownell, Lake City.

Vice-president, Thomas Crawford, Clinton.

Secretary, W. N. Keiser, Des Moines.

Treasurer, W. A. Mall, Belle Plaine.

The Executive Committee consists of A. L. Dodd, Charles City; Edward Reavy, Davenport, Iowa; and Gus Lundgren, of Cherokee.

The next meeting will be at Sioux City at a date to be fixed by the executive committee later.

SIXTH ANNUAL CONVENTION OF THE IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION.

The sixth annual convention of the Iowa Street and Interurban Railway Association was held at the American Auditorium, Cedar Rapids, Iowa, April 22, 23, 24. Mayor Carmody read the address of welcome, which was replied to by Judge J. L. Kennedy, of Sioux City. P. P. Crafts, of Clinton, the president, read his

address, from which the following is abstracted:

Up to a few years ago, the only traffic looked for by electric-railway managers was the regular passenger business in the summer months. Nowadays, the managers of city roads are pointing their energies to special lines of city traffic and the interurban managers to freight, express, mail, and other revenue-producing lines of traffic.

It was pointed out that the regular service, and not low fares, induced traffic, and, therefore, the managers have devoted some time and money to the maintenance of accurate train schedules, the better upkeep of equipment, track, etc., with correspondingly good results in net earnings. By these means not only are earnings increased, but also the good-will of the general public, which is an indispensability to public-service corporations. Moreover, a strong tendency to increase the faith of the investor in electric-railway securities has been established.

Mr. Crafts urged upon his hearers the importance of adopting the Interstate Commerce Commission's system of accounting without alteration or addition. Another matter to which he called attention was that of operating rules for both interurban and city railways, especially the former. In conclusion, the president drew attention to the papers which were to follow and to the electric-railway exhibits at the show. He kindly thanked the officers and members of the association for their co-operation and support for the past year and wished them increasing success in the years to come.

J. A. DuBois, chief train dispatcher of the Cedar Rapids & Iowa City Railway, read an excellent paper on operating rules for street and interurban railways, in which he gave in detail the manner in which the trains over the interurban are handled. In his discussion Mr. DuBois sought to impress upon his hearers the importance of adopting rules which have been tried and proved to be the best in the operation of trains, and also with the object of avoiding unnecessary delays. Connections with steam and other electric lines should always be made as advertised, for missing connections of this kind are absolutely certain to destroy public confidence in the reliability of the road.

Other papers that were read at this meeting were "Interstate Commerce Commission's System of Accounting and Its Application to Street and Interurban Railways," by H. E. Weeks, of Davenport; "Handling Accident Claims," by A. G. Ripley, of Des Moines; "Recent Development of the Electric-Railway Traffic of Street Railways," by E. M. Walker, of Muscatine; and of Interurban Railways, by C. H. Cheney, of Waterloo; "An Example of Successful Storage-Battery Engineering," by F. W. Lass, of Cedar Rapids; and "Inspection and Maintenance of Rolling Stock," by W. F. Raber, of Ottumwa, which was read by Mr. Forney, in the unavoidable absence of the author. Two papers on life-saving devices, one by Frank D. Miller, Buffalo, N. Y., and the other by W. J. Brown, New York city, were to have been read. Mr. Miller's paper will be included in the proceedings. Mr. Brown was ill and did not prepare his paper. At the conclusion of Friday's meeting it was proposed to retain the whole of last year's officers and in addition to elect E. M. Walker of Muscatine as vice-president. The convention closed on Saturday, April 24, when unfinished discussions were concluded and meetings of the executive committee, etc., took place.

GROUP AT THE CONVENTIONS OF THE IOWA ELECTRIC AND THE IOWA STREET RAILWAY ASSOCIATIONS, CEDAR RAPIDS, IOWA, APRIL 21-24.

Among the firms making exhibitions at the Electrical Show held under the joint auspices of these two conventions were the following: General Electric Company, Railway Specialty and Supply Company, H. W. Johns-Manville Company, National Lead Company, Holophane Company, Electric Service Supplies Company, Northwestern Electrical Equipment Company, Columbia Incandescent Lamp Company, Pacific Electric Heating Company, Ames Engineering Company, Duntley Manufacturing Company, Waterloo Electric Supply Company, Julius Andrae and Son Company, Westinghouse Electric and Manufacturing Company, International Register Company, Tungstolier Company, Mills Electric Company, American Electric Fuse Company, Wesco Supply Company, Central Electric Company, Sterling Light and Power Company, Monarch Electric and Wire Company, O. M. Edwards Company, Handlan-Buck Manufacturing Company, Standard Underground Cable Company, Fort Wayne Electric Works, Manhattan Electrical Supply Company, The 1900 Washer Company, the Bryan-Marsh Company, Illinois Electric Company, National Carbon Company, Wolcott and Murray Manufacturing Company, F. K. Deal Company, Century Electric Company, Nernst Lamp Company, Hobart Electric Company, Federal Electric Company, W. R. Garton Company, the Westinghouse Machine Company, Electrical Appliance Company, Everstick Anchor Company, American Steel and Wire Company, American District Steam Company, Ohio Brass Company, American Brake Shoe and Foundry Company, J. B. Terry Company, Perfection Vacuum Cleaning Company, Moline Incandescent Lamp Company, National Cash Register Company, General Compressed Air and Vacuum Machinery Company, Western Electric Company, Rooke Automatic Register Company, Atlas Railway and Supply Company, McConway and Torley Company.

Electrical Engineers Visit the Gary Steel Plant.

Under the joint auspices of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers, a party of 432 electrical engineers from Chicago and their friends made an excursion to Gary, Ind., on April 24. A special train of seven Pullman coaches left the LaSalle Street station on the Lake Shore Railroad at 10:45 a. m. and carried the party directly to the new "Steel City."

As the party left the train and marched down the main street, Broadway, it looked as if they had come to take full possession of the town. However, all they attempted to do was to take complete possession of two eating places, which were taxed to their capacity to provide luncheon for them.

At one o'clock the inspection of the steel works was begun. The immense ore docks were first visited, the charging equipment for the blast furnaces was then examined, and the large electric power house was inspected in all its details. A great deal of interest was taken in the installation of the gas engines, a large number of which are still under construction. The switchboard and storage-battery installations excited considerable attention.

The open-hearth plant was next visited. Here was seen first the tapping of a furnace with all its spectacular effects, and then the awe-inspiring, perfectly-controlled lifting and transfer of a ladle completely filled with nearly eighty tons of molten steel by means of an electric traveling crane and the casting of ingots from the suspended ladle. The charging of the open-hearth furnaces by means of electric-charging machines and traveling cranes was witnessed with much interest.

From the open-hearth plant the party was conducted to the now famous rail mill. The soaking pits were first seen and the method of passing the ingots from them to the first set of rolls. The process of rolling was watched in detail from the blooming rolls through to the finishing rolls. The motor equipment for driving the rolling mill, which is one of the distinctive features of the entire plant, was looked into and studied, the control of the motors receiving much attention. From the rail mill the visitors passed through the rail-straightening and drilling departments and finally through the shipping yard and various shops of the plant.

The inspection of the works proved to the visitors not only the large scope on which the entire undertaking has been planned, but gave them a very excellent idea of the electrical features that had already been described briefly in the Institute paper read by B. R. Shover, electrical engineer of the Indiana Steel Company. At 5 p. m. the special train took the party back to Chicago. All that went on this excursion agreed that it was one of the most profitable and interesting trips ever undertaken by them.

Chicago Electric Club.

At the regular Wednesday noon luncheon of the Chicago Electric Club held on April 21, H. B. Gear, chief of the inspection department of the Commonwealth Edison Company, gave a very interesting talk on the distribution system of that company.

The main distribution from the power stations to the various substations throughout the city is at 9,000 volts and twenty-five cycles. A 20,000-volt line has been built to Evanston to supply the Northwestern Elevated substation and that feeding the Chicago & Milwaukee Electric Railroad. A similar twenty-five-cycle, 20,000-volt line is being installed from the Fisk Street Station to Blue Island. This line will be finished this fall. At night when the load becomes small the power house of the Chicago & Milwaukee Electric at Highwood is shut down and then current from the Fisk Street Station is used to supply the entire system up to Milwaukee, a transmission of over ninety miles.

In the Commonwealth Edison system there are thirty-two substations and of these twenty-three contain rotary converters. Six contain motor-generator sets changing the 9,000-volt, twenty-five-cycle current to 4,000-2,200-volt, sixty-cycle current. Three substations are equipped with storage batteries exclusively, and altogether there are in fifteen substations twenty storage batteries having an aggregate capacity of 18,000 kilowatt-hours at the one-hour discharge rate. Their chief function is protective, although they are also used for leveling off peaks. Two substations are merely step-down transformer stations.

A new substation is being erected near Twenty-second Street and Kedzie Avenue, which will be a straight transformer station receiving 12,000-volt current at sixty cycles. At the present it will be fed from a motor-generator set installed at the Quarry Street Station. A system of 12,000-volt, sixty-cycle lines will be installed for future remote substations. As the load in the remote sixty-cycle district builds up it is intended to install 12,000-volt, sixty-cycle generators to supply these lines directly.

In the business district the distribution is entirely by direct current on the three-wire 115-230-volt Edison system. All current supplied to consumers outside the business district is sixty-cycle alternating current. Up to five horsepower alternating-current motors may be single-phase, but above that they are required to be three-phase. Up to one horsepower they may be either 110 or 220-volt motors; above one horsepower they must be 220-volt machines. All alternating-current motors must be installed separately from the lighting circuits. The service voltage throughout the city whether alternating current or direct current is 115 and 230 volts. All lights are connected on the 115-volt circuit. Circuits containing more than twenty-five lights must be on the three-wire Edison system.

All direct-current lines were formerly in Edison tubes. Some eight or ten years ago these were abandoned in new construction. The cable and conduit system is now used exclusively for underground mains. The standard direct-current feeders in the downtown district are 1,500,000 circular-mil cables. These can be loaded up to 1,500 amperes for one-half-hour maximum peaks. There are also many 1,000,000 circular-mil cables used. The standard alternating-current cables contain four No. 0 conductors connected on the three-phase star system with grounded neutral. This gives 2,200 volts between any phase and neutral.

The downtown service connections are made below the sidewalks. In the alternating-current district they are almost invariably made from the alley line. In the latter district the main section and one-half-mile streets have underground primary cables that form a connected gridwork. This system is connected at alley intersections with overhead distributing feeders that are run on the dead-end plan with a transformer for each block as a rule.

Mr. Gear concluded his talk by describing the pole construction used for these alley lines. About a year ago there were some 35,000 poles in service carrying the sixty-cycle distribution system. About 25,000 of these poles were used jointly with the telephone company. The advantages of joint occupancy were explained as well as the standard method employed.

Power Companies Suffer Damage in Ice Jam at Niagara Falls.

(From our Niagara Correspondent.)

It is very certain that the various interests that have to do with the scenic and industrial features in and about the

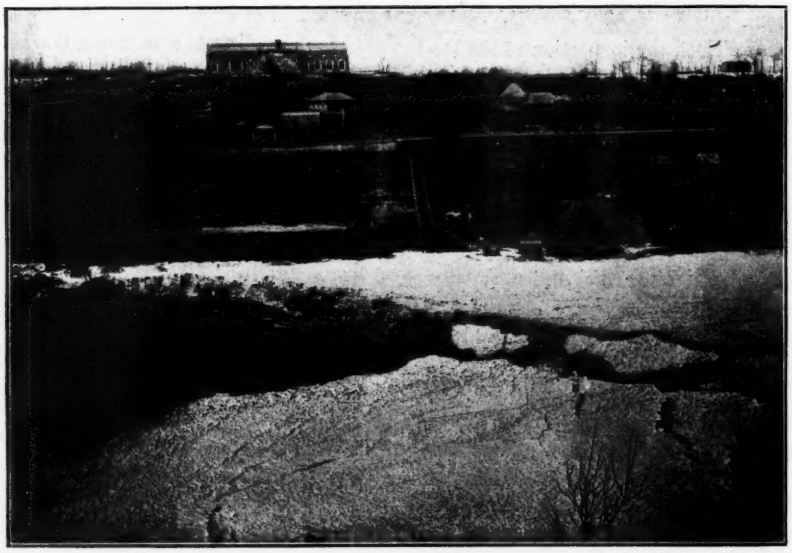
LOOKING DOWN NIAGARA RIVER FROM CANADIAN SIDE.

Niagara locality were never quite so amazed and shocked as they have been by the capers of the river and its ice cargo during the month of April.

THE GORGE ROAD WAS BURIED UNDER THIS MASS OF ICE FOR THE ENTIRE DISTANCE ON THE RIGHT BANK.

When the present week opened, it was evident that the Ontario Power Company and the Niagara Gorge Railroad Company were the two worst sufferers, but the damage to their property was not the full limit of destruction, for docks, boathouses and boats, private water-pumping stations, fish-traps, as well as other structures, including towers of a great power-transmission line, were razed or carried away. One, if not two, of the great bridges of the Niagara Gorge were endangered, and hotels thought to have been erected far beyond the zone of danger from ice or water had to be guarded day and night, for fear they would fall prey to the crushing force of the ice jam.

The Ontario Power Company's power house is located at the water's edge on the Canadian side of Niagara River. It is the closest building in the Horseshoe Fall, which fall always discharges the largest quantity of ice from the higher to the lower level. This power station has the horizontal-shaft system of development, its turbines and generators being direct-connected. The units are 10,000 horsepower and over. On the night of Friday, April 9, this power station was flooded by water and ice that entered through the windows and a door, necessitating the shutting down of the plant. Normal water in front of the station is 343 feet above sea level, but at the time the station was flooded it is estimated that the height of the river was about 383 feet, or about forty feet higher than usual. When the power house was erected, a very careful review of all available data was made in order to make a proper selection of the site. At that time it was figured that twenty-eight feet was beyond the danger point, that appearing as the highest previous obtainable record for the river. So tremendous was the inflow of water and ice into the station that hundreds of tons of ice were left on the power-house floor, and this had to be shoveled out through the windows as soon as the water receded and labor was obtainable. Two or three times after this the station was again threatened, but it was not again flooded during the jam. The company admitted a damage of $100,000 to the machinery alone, exclusive of the high-grade lubricating oil, of which, under normal conditions, about 100 barrels are in constant use on the various bearings. With commendable promptness, the Ontario Power Company began operations to recover itself and resume its acquired position in the power world of Niagara. Men were quickly set to work to clear the ice from the station. The company's electrical engineering force, assisted by experts from the Westinghouse company, were equally active in giving attention to the machinery, but the operation of the power house was suspended for some days.



ICE FORMATION IN FRONT OF THE POWER HOUSE OF THE ONTARIO POWER COMPANY.

Inasmuch as the Ontario Power Company had its transmission lines extending far into the interior of the state of New York, and was a wide distributer of power, the effect of the disaster was extended, but the Electrical Development Company of Ontario and the Canadian Niagara Power Company took up parts of the load of the Ontario company. The injury to the power interests was still further intensified by the fact that the steel towers erected on the Canadian side of the river, to support the cables of the aluminum power-transmission line of the Ontario Power Company, also became

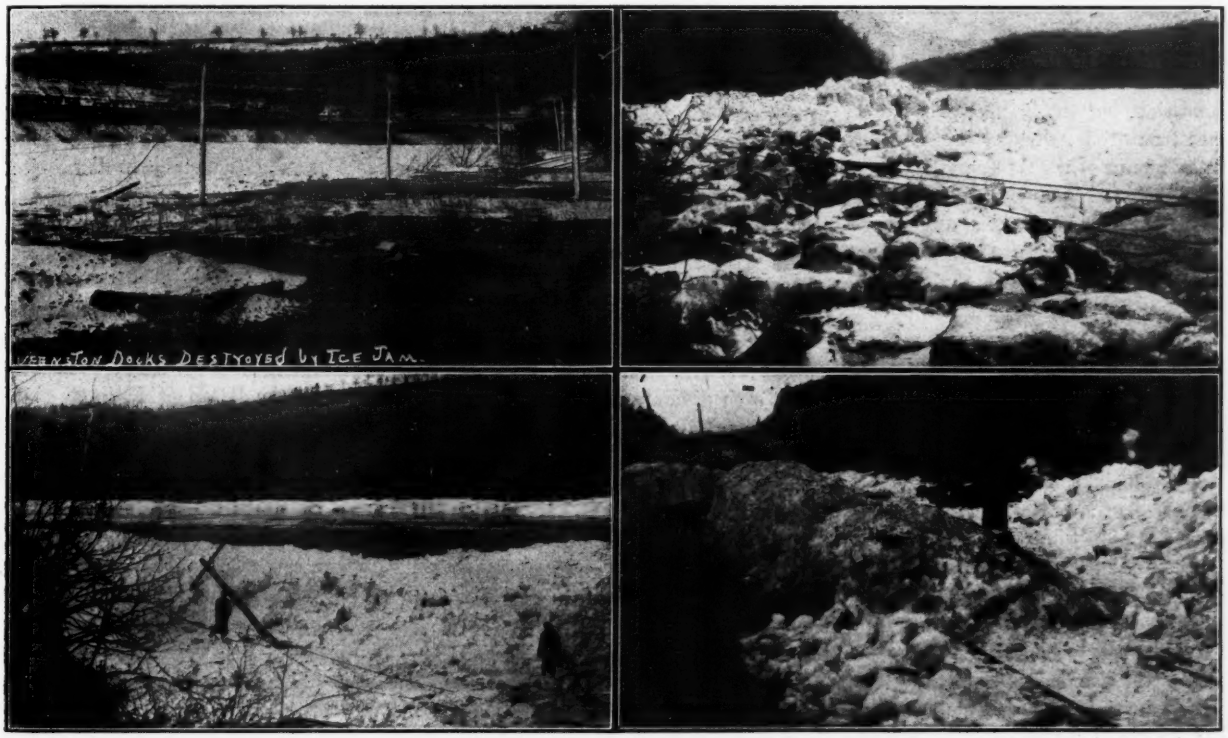
mixed up with the ice jam below the Devil's Hole. These towers had been placed at what was believed a safe point, but the ice crowded all about them, and at least two of them were capsized, and were on the ice at this writing.

While the power house of the Niagara Falls Hydraulic Power and Manufacturing Company is also at the water's edge in the gorge, it is on the New York State side, and further down stream. When the water was at its highest point its line was above the basement floor of this station, but it did not get in, a solid wall preventing entrance. The scene in the river, in front of this power house, was impressive of the mightiness of the jam.

owing to later floods, until it was felt the danger period had passed. It is difficult to estimate the extent of the damage to this scenic line. It will be impossible for the company itself to indicate its loss until such time as repairs have been made, and the extent of such repairs will not be known until the roadbed is free from ice and open to inspection.

The International Railway Company owns the great upper steel arch bridge, as well as the suspension bridge near Lewiston, both of these great structures being links in the electric-car belt-line service about the Niagara Gorge. The ice piled up about the abutments of the steel arch in a menacing manner, and is not

before witnessed by present-day residents. At one time the ice jam was solid from the whirlpool to Lake Ontario, a distance of over eleven mines. Throughout all that section of the gorge in which the electric cars are operated the cliffs are high, and there was little danger of flood, but between Lewiston and the mouth of the river greater danger prevailed, as the ice actually crowded fully forty feet up to and against hotels that occupy high positions on the river bank, over the dock so familiar to electrical engineers and others who have taken steamboats at this point for Toronto. The ice was so high that it had to be chopped away from the veranda of one of these hotels, and the



THE NIAGARA ICE JAM.—QUEENSTOWN DOCK DESTROYED AND TROLLEY TRACKS COVERED. THE GORGE ROAD NEAR THE DEVIL'S HOLE. POLE-LINE AND CABLES CAUGHT IN THE ICE PACK. WHERE THE START WAS MADE TO DIG OUT THE GORGE ROAD.

The Gorge Railway is the scenic line along the water's edge on the New York State bank. Its roadbed is at no point below the whirlpool rapids very high above the normal river, and so this flood of ice and water swept over it for almost the entire distance between the Devil's Hole and Lewiston, while at points between the whirlpool and Devil's Hole it was also buried. Miles of the pole line and wire were broken down, and for miles the roadbed was left under a mass of ice varying from ten to twenty feet in thickness. When the water first showed signs of receding, steps were made to dig the roadbed out, but this had to be suspended

yet removed, but the company appeared unmoved by the situation. However, the peril of the suspension bridge was apparent to all, for, while the deck of this structure is from sixty-five to eighty-five feet above the normal level of the river, the ice jam piled up under it until not more than from fifteen to eighteen feet of space was between them, the scene being one of the most notable in connection with the jam.

From the falls to the whirlpool rapids the jam was a solid mass. The rapids kept the river open at that point, but the great whirlpool was bridged by the mass in its entirety, a spectacle seldom if ever

veranda had to be roped to the building so that it would not be carried away.

This was the critical stage when the United States War Department was notified by Collector Merritt of Niagara Falls of the danger, who asked if relief could not be afforded by that department. United States Army engineers reported that nothing could be done, leaving the panic-stricken residents to their danger. Then Sanford White, president of the village of Lewiston, sought the aid of Governor Hughes, who promptly asked the State Department of Works to act. Assistant Superintendent Kunze investigated the situation and decided to use

dynamite in blasting the ice at the mouth of the river, it being evident that the jam was so thick that it was there touching bottom, preventing the flow of the water to the lake. Thus it will be seen the giant jam had with its might turned the Niagara gorge into a huge storage reservoir, into which millions of gallons of water and thousands of tons of ice were being hurled every second, only to add fury to the pressure being exerted there at some point. With the flow of the Falls of Niagara continuing night and day, as Lake Erie emptied her waters, it could be only a matter of time when there would be a frightful bursting of the temporary dam, carrying with it unknown dangers and damage. The blasting began about noon on Thursday, April 22, and by Friday morning following the water had gone down sixteen feet, the drop continuing until the river approached a normal condition, but the ice remained quite firm until Saturday, when it began opening at the mouth of the river, and by Sunday, April 25, channels had opened through it between Lewiston and Youngstown, the ice gradually breaking away on both sides and passing down the river in huge blocks, when it seemed as though the imprisoned river would soon be freed of its load. However, a strong wind came up about noon Sunday, and it was felt that this might change the situation within a few hours, as it was a high wind, that swept the lake and river section on Wednesday, April 7, that developed all the danger. This wind was of hurricane proportions. It shattered the ice field in Lake Erie as it never before was shattered. Then it drove it down to Buffalo and into the river channel, to be swept to the falls and gorge. It was deposited in the gorge in such quantities that, owing to the resistance offered by the crowded eddies, the rocks, turns and curves of the stream, its outflow was not rapid enough to prevent the jam, which will go down in history as the greatest ever known in the Niagara section.

Last Sunday State Engineer Williams and one of his deputies made an official inspection of the ice jam, and as they found the channel gradually opening, it was concluded that no further dynamiting was necessary. The cost to the state of breaking the jam will be about $4,000.

On Monday the Gorge road had a large force at work trying to clear away the ice on its tracks. There was at that time a very large quantity of ice all along the shore, and it will take a long time for this to pass away.

Commercial Wireless Telegraph Operation Begun on the Great Lakes.

Regular commercial operation of wireless telegraphy was inaugurated on the Great Lakes by the United Wireless Telegraph Company on April 26, general business and press messages being conducted between its Chicago station, the Benton Harbor (Mich.) station and steamers of Graham & Morton Steamship Company.

A particular feature of the first day's operations was a special trip of the steamer Puritan of the Graham & Morton Company, which took some fifty invited guests of Mr. Morton for an eighty-mile trip on the lake to witness a practical demonstration of "business" wireless on Lake Michigan. Among the guests were newspaper representatives from Chicago and other cities.

The steamer left her dock about 11 a. m., and from the time she cleared the breakwater until her return was in constant communication with both Chicago and Benton Harbor stations. At 11:30 the guests aboard began sending wireless messages, and when the ship was forty miles from either station some of the newspaper representatives sent out messages of 250 to 300 words. The operator on the Puritan was kept busy from 11:30 until 3:15, and during that time he sent forty-seven different messages either to the Chicago or Benton Harbor station, and received on the boat thirty-four reply messages. The messages sent out contained from ten words up as high as 300 words, the latter being special dispatches of the newspaper representatives. Approximately about 3,500 words were sent, and something like 1,000 words received in less than four hours. The speed at which the messages were handled, including checking, signatures and addresses, averaged about thirty words a minute during the entire period of continuous operation. The work was handled with no more errors than occur in wire transmission, and at all times both land stations came in as clearly as though the Puritan were only a mile or so out.

During the trip the Puritan picked up a message being sent from a Savannah Line steamer off the Atlantic coast to New York. All of the guests expressed themselves as being well pleased with the demonstration and urged that the wireless service be extended to cover the Great Lakes with all possible speed.

An elaborate luncheon was served from the regular dining service of the steamer, which is in heavy freight and pleasure resort passenger service to several ports on Lake Michigan. The Graham & Morton Company has been so impressed with the demonstrations made by the United Wireless Company's Shoemaker apparatus that it has equipped all of its steamers with similar apparatus.

Private Capital for New York Subways.

The Travis-Robinson bill, amending the Rapid Transit Act to permit the building of additional subways in New York city with private capital, passed both branches of the New York Legislature on April 23. The bill now goes to the mayor for his approval. Representatives of the Public Service Commission of the First District, who drafted the bill, expressed satisfaction when the measure was passed.

It provides that the commission, with the approval of the Board of Estimate and Apportionment, may grant a franchise to a private corporation, and that the railroad shall be built at the expense of the holder of the franchise. The city is to reserve the right to terminate the franchise after ten years on specified notice and to buy the property at a sum not exceeding the actual cost of the plant and property with fifteen per cent added.

Provision is also made for the building of rapid-transit roads to be owned by the city, and the commission, with the approval of the Board of Estimate and Apportionment, shall have power to determine whether all or any portion of the expense of construction shall be assessed upon the property benefited.

No action has yet been taken by the Assembly on the Travis-Lee constitutional amendment removing the cost of self-supporting subways from the computation of New York city's debt limit.

Wireless Telegraph Stations in Burma.

From Rangoon Consul E. A. Wakefield writes that wireless telegraph stations have been erected at Mergui and Victoria Point in Lower Burma. He says:

"Victoria Point is the southernmost point in Burma, at the mouth of the Pakchan River, which forms the boundary between Burma and Siam. Mergui is on the coast, 160 miles north of Victoria Point, with direct wire to Rangoon and Calcutta. These stations have only just been completed, so that specific information is not readily available. The system in use is not the Marconi, but it is supposed to be the de Forest, according to one of the officials in the government telegraph office at Rangoon. Operators have been sent to the stations and they were to be in service from February 15."

GENERAL ELECTRIC COMPANY.

SEVENTEENTH ANNUAL REPORT FOR THE YEAR ENDED JANUARY 31, 1909.

The seventeenth annual report to the stockholders of the General Electric Company, Schenectady, N. Y., for the year ended January 31, 1909, shows the profits for the year to be $4,802,252.67. This includes $35,912.48 from securities sold and $1,453,942.63 from royalties, dividends, interest, etc. This is also after deducting all patent, general and miscellaneous expenses, fixed charges and allowances for depreciation and losses and writing off $1,524,295.32 from factory plants. Dividends to the amount of $5,214,026 were paid, leaving a deficit of $411,773.33, which was charged to the surplus account, which leaves the total surplus on January 31 at $16,102,062.81.

The year was marked by severe and continued depression in business. Very few new enterprises requiring apparatus were brought out, and since the last annual report the business of the company depended largely upon current renewals and supplies with an occasional addition to the plant on the part of the older and more prosperous companies. The orders received by the company during the year were only seventy per cent of those received for each of the two years previous. The shipments to customers were only sixty-three per cent of the shipments for 1907.

Business conditions are slowly improving and the company's collections have greatly improved, so that accounts have rarely been in a more satisfactory condition than at present.

Among the more important contracts received were the following:

Chattanooga and Tennessee River Power Company, Chattanooga, Tenn.: 60,000-kilowatt capacity in generators and transformers, stepping up to 44,000 volts for transmission to Chattanooga, Tenn.

Connecticut River Power Company, Brattleboro, Vt.: Five 2,500-kilowatt generators with switchboard and complete transformer equipment stepping up to transmission potential of 66,000 volts.

Isthmian Canal Commission: Complete electrical equipment for two power stations and electric transmission plant furnishing power and light for the construction of the dams at Gatun and Miraflores, Isthmus of Panama. Each of the two power stations will be equipped with three 1,500-kilowatt Curtis turbine generators. The order also includes twelve electric locomotives and numerous motors and other electrical equipment required for this work.

Washington Water Power Company: For a new plant at Little Falls on the Spokane River, two 5,000-kilowatt generators together with necessary transformers stepping up to 63,000-volt transmission line.

City of San Francisco: Eight 750-horsepower and four 600-horsepower Curtis steam turbines for driving centrifugal pumps for a high-pressure water system. This is the first application of steam turbines for this class of service on a large scale.

Hudson Tunnels Company, New York: Additional car equipments.

Southern Pacific Railroad Company, Oakland, Cal.: Rotary converter apparatus to be used in supplying current for the 1,200-volt direct-current car equipments.

Great Western Power Company, San Francisco, Cal.: One 10,000-kilowatt generator and ten transformers additional to the apparatus previously purchased for the 100,000-volt, 165-mile, hydroelectric transmission plant, now in operation.

Approximately 7,000,000 square feet of floor space are being operated, and the building, of 142,000 square feet, for the manufacturing of wiring devices at Schenectady has been completed. At the Lynn works a new building, with 99,000 square feet of floor space, for the production of meters and instruments, has been completed, and work on another building, of 71,000 square feet, to be used as a carpenter shop, pattern shop and pattern storage, while deferred because of business conditions, has now been resumed.

An iron foundry at the Pittsfield works, with 59,000 square feet of floor space, was completed and is now in operation. At the Harrison lamp works, buildings with 92,870 square feet of floor space were completed and are now in use.

In engineering, the use of high electric pressures has been so satisfactory that 150,000 volts is being suggested in pending propositions. In this connection the sales of transformers for 60,000 volts and over during the last year were nearly double those of 1907. Switches capable of controlling 110,000 volts have been designed and placed in commercial operation. Two 14,000-kilowatt turbines have been placed in operation in Chicago and two in New York, and these have proved satisfactory in every respect, and orders for additional units of the same size have been placed with the company.

The 1,200-volt railway system has been further perfected and the installations made have proved an unqualified success. The thirty-five electric locomotives sold to the New York Central have made records for reliability and low cost of maintenance, and the company has just completed an order for twelve additional locomotives with similar design. The electric locomotives sold to the Great Northern Railway Company for its Cascade Tunnel division have been completed and satisfactorily tested and shipped.

The following tabulations give the consolidated balance sheet and the consolidated profit and loss account as of January 31, 1909:

CONSOLIDATED BALANCE SHEET OF JANUARY 31, 1909.

Assets.

Patents, franchises and good will		$ 1.00
Cash		22,233,671.29
Stocks and bonds	$21,922,189.21	
Real estate (other than factory plants)	85,124.66	
Notes and accounts receivable	18,873,057.63	
Work in progress	607,276.59	
	$41,487,648.09	
Merchandise Inventories:		
At factories	$15,682,255.88	
At general and local offices	2,547,326.08	
Consignments	164,317.44	
	18,393,899.40	
		59,881,547.49
Factory plants (including all lands, buildings and machinery)	$13,900,000.00	
Copper mining investment	3,174,580.76	
		17,074,580.76
		$99,189,800.54

Liabilities.

5 per cent gold coupon debentures of 1892	$ 41,000.00
3½ per cent gold coupon debentures of 1902	2,047,000.00
5 per cent gold coupon debentures of 1907	12,875,000.00
Accrued interest on debentures	107,633.36
Accounts payable	2,836,834.51
Unclaimed dividends	1,469.86
	$17,908,937.73
Capital stock issued	65,178,800.00
Surplus	16,102,062.81
	$99,189,800.54

CONSOLIDATED PROFIT AND LOSS ACCOUNT OF JANUARY 31, 1909.

Expenses.

Cost of sales (including depreciation of plants $1,524,295.32)		$41,649,573.13
Interest on debentures		716,643.61
Profit for the current year		4,802,252.67
		$47,168,469.41
Dividends paid in cash		$ 5,214,026.00
Surplus at January 31, 1909, carried forward to next year		16,102,062.81
		$21,316,088.81

Earnings.

Sales		$44,540,675.57
Profit on sales of stocks and bonds		35,912.48
Royalties, dividends, bond interest and sundry profits	$703,942.63	
Surplus earnings manufacturing and other companies	750,000.00	
		1,453,942.63
Interest and discount		1,137,938.73
		$47,168,469.41
Surplus brought over from last year		$16,513,836.14
Profit for the year ending January 31, 1909		4,802,252.67
		$21,316,088.81

QUESTIONS AND ANSWERS.

ELECTRIC PUMPING.—A friend of mine, who is the engineer of the modest waterworks of a neighboring town, has been told by the superintendent of the local private electric-lighting plant that they could do the pumping much cheaper by electricity than the town now does by steam. The engineer does not believe it possible to do the pumping by electricity at all. Is he right? If not, is the superintendent's claim justified?—O. R. R., Lincoln, Neb.

The engineer is not right, for electric pumping is not only feasible, but has been carried out in many highly successful installations on both small and large scales. The most common method of electrically operating pumps is by means of an electric motor geared to the pump; in this case a triplex (three-cylinder) pump is generally used to give a more uniform load throughout the motor's rotation. Air-lift pumping can also be operated electrically by using a motor-driven air pump. Probably the best way to utilize electricity for pumping is by direct-connecting the electric motor to a centrifugal pump. For high pressures a multi-stage centrifugal pump is used. The reliability of electric pumping is illustrated by its adoption for the high-pressure fire service in New York city, where a pressure of 300 pounds per square inch can be developed in a few minutes after giving the signal (see WESTERN ELECTRICIAN of October 10, 1908). The superintendent's claim for economy is doubtless justified, for the average waterworks of a small town is run at far from an economical basis. Features of electric pumping that conduce to economy, aside from the dispensing with fuel, are automatic control, which eliminates constant attendance, and low cost of installation, which reduces the fixed charges.

FLAMING AND LUMINOUS ARC LAMPS.—What is the difference between flaming and luminous arc lamps? What are magnetite arc lamps, and how do they work?—E. J. S., Watertown, Wis.

Flaming arc lamps are provided with cored carbons impregnated with salts of calcium, strontium, or sodium, that are readily volatilized at the great heat of the arc and impart to it a flaming effect having the characteristic color of these metallic vapors. The so-called luminous arc lamp is better known as the magnetite arc lamp and has a positive electrode composed of an iron tube filled with a mixture of iron oxide (magnetite), titanium and similar oxides, and a negative electrode composed of a solid block of copper. In some of these lamps the copper electrode is placed on top and in another make it is put below. The oxide mixture vaporizes and gives to the arc a strong white light, which is well distributed sideways and adapts the lamp for street lighting. By careful design of the lamp natural drafts are arranged to carry away the fumes produced by the arc. The magnetite electrode burns for some 250 hours, while the copper electrode lasts over 2,000 hours. These lamps require direct current, so if placed on an alternating-current distributing system a mercury-arc rectifier is usually employed.

AUTOMATIC AND AUTO-MANUAL TELEPHONE SYSTEMS.—What is meant by the auto-manual telephone system? Where can I find a good description of the automatic system?—R. St. C., Jacksonville, Fla.

The auto-manual system is a combination of the automatic and the manual (operator-controlled) systems. It is used largely with private exchanges in large business houses that have several trunk lines connected with the automatic telephone system of the town and a large number of ordinary telephones in their various departments connected with a single private switchboard in charge of one or more operators. This operator interconnects the various department lines and also calls up any automatic city line desired and connects it with the calling private line, as well as the reverse of the latter operation. A series of illustrated articles descriptive of the automatic telephone system appeared in the WESTERN ELECTRICIAN of January 11, 18 and 25, 1908.

INTERRUPTERS AND RECTIFIERS.—(1) Kindly tell me how to make a good electrolytic interrupter. (2) How to find the amperes in the secondary of an induction coil. (3) What is a good electrolyte for an electrolytic rectifier? (4) Approximate price of a mercury-arc rectifier.—C. A. S., Los Angeles, Cal.

(1) A simplified form of the Wehnelt electrolytic interrupter is made by using as an anode a steel wire about fifty to eighty mils in diameter and as a cathode a copper wire from 120 to 160 mils in diameter. These wires are to be enclosed for almost their entire length in glass tubes having each a small hole at the end to permit the wire to be exposed a small but adjustable amount. These tubes are mounted in a jar containing sulphuric acid diluted to about twenty degrees Baumé. The steel wire is rapidly used up, but can be moved forward in its tube. (2) The current in the secondary coil can be found only by means of an alternating-current ammeter, which gives its effective value. (3) A fairly good electrolyte for rectifiers is a neutral solution of ammonium phosphate in water and of a strength depending on the size of the electrodes used. One electrode is of pure aluminum and the other of lead or polished steel. (4) The cost of a mercury-arc rectifier outfit completely mounted with its auxiliary apparatus and an ammeter and adapted to change 110-volt alternating current to about ten amperes direct current at about ten volts is close to $85, or without the ammeter $70. As the price depends on the voltage of the alternating-current supply and that of the direct current desired, as well as on the current capacity needed, it is best to write to the manufacturers for prices, giving in detail all these data and a statement of exactly what service the rectifier is to be used for.

National Electric Light Association—Transportation Arrangements for Atlantic City Convention.

Arrangements have been made with the Pennsylvania Lines for a special train from Chicago to Atlantic City for the National Electric Light Association Convention, June 1 to 4. This train will leave Chicago, Sunday, May 30, at 3 p. m., arriving at Atlantic City early in the afternoon on Monday, May 31. It will be known as the "Electric Light Special" and will run as a second section to the eighteen-hour train; a duplicate of that train in equipment. It is the finest train the Pennsylvania Lines operate, and consists of composite or club car, standard sleepers, compartment, dining and observation cars, all electrically lighted.

The Central Passenger Association has authorized a rate of a fare-and-three-fifths for the round trip from Chicago to Atlantic City, on the certificate plan. Tickets will be on sale from May 27 to June 2, inclusive, good returning up to June 8.

Tickets purchased for this convention will permit of stop-over at Philadelphia, Washington, Baltimore and Pittsburg, returning, but should one desire to take advantage of the privilege of stopping at Washington or Baltimore it will be necessary to ask for ticket and certificate reading via Washington at time of purchase.

Delegates desiring to join the convention party on the "Electric Light Special" are requested to make their reservations early by applying to City Ticket Agent, Pennsylvania Lines, 248 South Clark Street, Chicago, or to John J. Schayer, 139 Adams Street, Chicago.

Fifth Annual Convention of the Southwestern Electrical and Gas Association.

The fifth annual convention of the association will be held in the city of Dallas, Tex., May 20, 21 and 22, 1909.

The meetings will be held in the banquet room of the Southland Hotel on Thursday morning and afternoon, May 20, Friday morning and afternoon, May 21, and Saturday morning, May 22.

The exhibits will be shown in the large billiard room of the Southland Hotel. This space will be furnished, free of charge, to those desiring to make exhibits, and a charge not to exceed five cents per kilowatt-hour for power, and ten cents per kilowatt-hour for lighting, may be made. Members wanting space reserved should communicate at once with D. G. Fisher, 300 Commerce Street, Dallas, Tex. J. C. Woodsome, 360 Commerce Street, Dallas, Tex., will assist exhibitors in securing decorative material, electricity, etc.

The convention basis of railroad rates will be in effect for this meeting. Information relating to these rates can be obtained from J. P. Griffin, 300 Commerce Street, Dallas, Texas. Delegates coming from the East should confer with Sam A. Hobson, St. Louis, Mo., or Manton Mill, room 539 Frisco Building, St. Louis, Mo., for information regarding transportation facilities, or the reservation of sleeping-car accommodations.

Generous plans of entertainment for delegates and for visitors of both sexes have been made.

On the evening of Friday, May 21, there will be a grand "Rejuvenation" meeting of the "Sons of Jove" held at Turner Hall.

In order to accommodate the rapidly-growing "Gas Interests," it has been found advisable to carry on a special meeting dealing only with papers and subjects relating to this department. This meeting will be presided over by one of the vice-presidents of the association and will be in session on the morning of Friday, May 21.

The following papers have been prepared for this convention: "Producer Gas Plants for Small Central Stations," by W. B. Head, Stephenville, Tex.; "Scope of Legal and Claim Departments and Their Relation to Each Other," by H. S. Cooper, Galveston, Tex.; "Organization and Operation of a Claim Department," by W. C. Forbes, Ft. Worth, Tex.; "Lamps for Residence Illumination; Their Characteristics and Comparative Economy of Operation," by Prof. A. C. Scott, Austin, Tex.; "Low Pressure Turbines," by Fred M. Lege, Jr., Galveston, Tex.; "High Pressure Gas Distribution for Commercial Purposes," by H. M. Moore, Austin, Tex.; "A Method of Determination of Total Sulphur in Gas," by L. B. Morehouse, San Antonio, Tex.; "Preparation of Purifying Material and the Purification of Gas," by Clark F. Farmer, Austin, Tex.; "Economies That Can Be Made in the Operation of a Small Central Station," by Thomas Cook, Waxahachie, Tex.

Japanese Electrical Industry.

Vice Consul-General E. G. Babbitt, of Yokohama, transmits an article from the Japan *Advertiser,* translated from a Japanese publication, the *Electricians' Friend,* showing the conditions of the electric industry of the Empire in 1908, from which the following statistics are compiled:

"Telegraphs.—The problem, which had been pending decision since Manchuria came into our control, was at last settled on November 7; consequently the Chefoo-Canton cable and the wires came into our possession. Telegraph offices at the close of 1908, 3,308; total length of telegraph lines, 5,387 miles; total length of wires, 92,227 miles; telegrams handled, domestic, 7,544,400; foreign, 363,260.

"Wireless: The Teishinsho system of wireless telegraphy in Japan, which differs from the Marconi and de Forest systems, has been improved as a result of the long study of the engineers concerned. Nearly all Japanese steamships on foreign lines are furnished with wireless telegraphy. In the navy all ships, from battleships down to torpedo-boat destroyers, are equipped with wireless telegraphy, and the wireless telephone was successfully used at the grand naval review off Kobe last autumn. The wireless telephone is being studied in the communication department and in the navy.

"The wireless seashore offices are at the following places: Chasi, Kadoshima, Ochiishi, Osozski, and Ushiozski.

"Telephones.—To cope with the rapid growth of commercial industry, the government undertook the second extension at an estimate of $10,000,000 gold for six years in succession from 1907, and invested $1,500,000 in 1908. In accordance with the rule that any place may be provided with a telephone exchange on special application, 122 regular and special exchanges were installed in 1908, including Formosa, Korea and Manchuria. Existing exchanges, 206.

"Light and Power.—Existing light and power industry at the end of 1908: Steam, 54,550 kilowatts; water, 31,951 kilowatts; gas, 105 kilowatts; total, 86,606 kilowatts, an increase of 12,090 as compared with 1907. It was worthy of special notice that the Tokyo Electric Light Company succeeded in the high transmission of 55,000 volts over a distance of forty-seven miles, from Katsura to Tokyo.

New York Academy of Sciences.

At the meeting of the New York Academy of Sciences on April 26, at Columbia University, New York city, two papers were presented that were both timely and interesting, being entitled "Reactions of the Pupil to Color," by Prof. S. W. Ashe, and "Studies in Visual Acuity," by D. E. Rice.

In the first paper Professor Ashe called attention to the low efficiencies of our electric-light sources, stating that the improvements in recent years had been accompanied by an increase in temperature with the exception of the Cooper Hewitt mercury-vapor lamp. He then reviewed the various photometers, standards of light and standards of illumination. The colors were obtained by means of colored glass and a Nernst lamp.

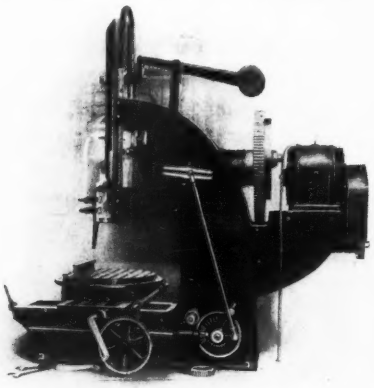
The result of a large number of tests showed that the pupil is open the widest under red light and contracts according to the spectrum, white, green and blue. In this connection the speaker stated that the ease with which detail could be observed under the green mercury lamp was possibly due to the contraction of the pupil. The paper by Mr. Rice contained an excellent review of the work done along similar lines, notably that of König, which seemed to contain a number of inconsistencies. As the result of a long series of experiments, Messrs. Broca and Laporte stated that the visual acuity varied the same as the intensity without respect to color, which Mr. Rice did not find to be the case, but rather along the lines given in the paper by Professor Ashe.

Comparing the intensity and acuity for several colors, it was found that the acuity increased rapidly up to two metre-candles, when it followed a nearly parallel line with the intensity. The relative increase in acuity under white light was given by the author as follows:

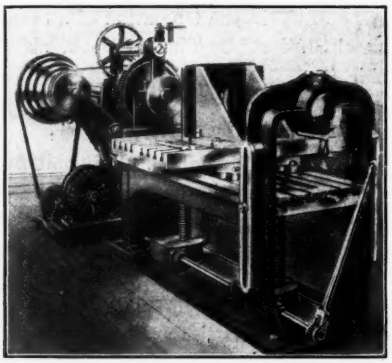
Metre-candles.	Acuity.
0.10	0.25
0.60	0.50
4.00	0.75
24.00	1.00
256.00	1.10

Boulton Shops of the Richmond, Fredericksburg & Potomac Railroad Company.

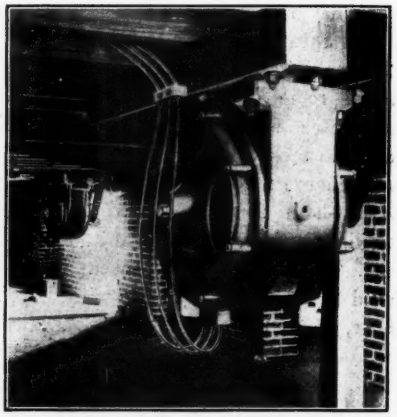
In every railroad shop there are two points which must be constantly kept in mind. These are: keeping the cost of repairs down and decreasing the length of time that the rolling stock is kept out of service while the work is being done.



SLOTTING MACHINE, BOULTON SHOPS.



HORIZONTAL BORING MILL, BOULTON SHOPS.



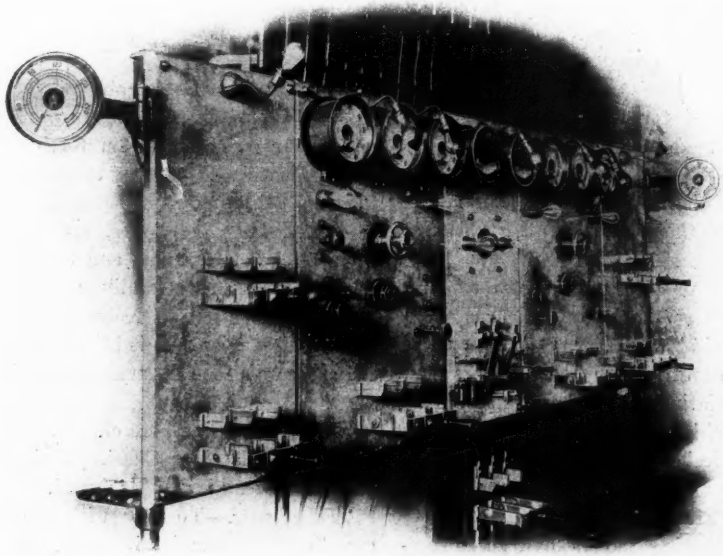
MOTORS BENEATH PLANING-MILL FLOOR, BOULTON SHOPS.

Every shop superintendent is ready to give a trial to any plan which, on investigation, offers good evidence of being capable of reducing these items. It has been urged in the past that the application of motors to the individual machines in railroad shops would effect many economies and the installations that have been made have fully justified all these statements. It is now an accepted fact that the best method in all respects for driving a railroad shop is by means of electric motors.

Flexibility in location is one important advantage which results from the use of motors, as the power is applied directly to the individual machines, and hence the location of each one in the shop, is independent of any line shaft or belting limitations. Only in the case of small machines is use made of line shafting, and here a few machines are driven from a short shaft, which is usually belted to a motor. Another important advantage is the gain which is made in the productive capacity of the machines; this shortens the time required for a given piece of work, and hence decreases the labor cost. Not the least important items are the high degree of reliability and great convenience of this method of drive.

An excellent example of the change from steam to electric drive is furnished by the Boulton shops of the Richmond, Fredericksburg & Potomac Railroad Company at Richmond, Va., familiarly known as the "Washington-Richmond Line," as it runs from Washington, D. C., to Richmond, Va., and is one of the fastest lines of communication between the two cities. The maintenance of the rolling stock and the manufacture of both freight and passenger cars are carried on at these shops. A three-phase, 220-volt, sixty-cycle system of distribution is employed with constant-speed induction motors.

The original electrification was begun about six years ago by the installation of a seventy-five-kilowatt belted generator which was used only for lighting purposes, and about one year later a 125-kilowatt Westinghouse generator was added to supply power for the machine shop. This is in use at present and is driven by a Ball engine of 225-horsepower capacity, direct-connected to the generator. Upon the erection of the new planing mill it was necessary to replace the seventy-five-kilowatt generator by one of 150 kilowatts capacity to drive the woodworking machines. This latter generator is direct-connected to a Ball engine of 250-horsepower capacity. The generators are excited from a 17.5-kilowatt, 125-volt, direct-current Westinghouse generator driven by a Troy upright engine. The larger generating unit and the exciter are shown in an accompanying illustration.



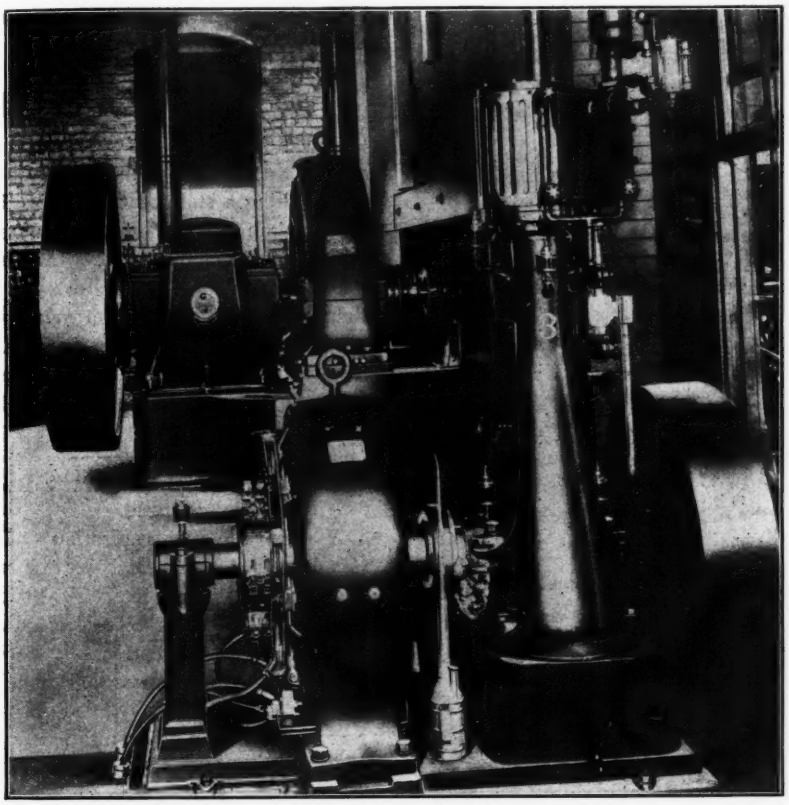
MAIN SWITCHBOARD, BOULTON SHOPS.

Steam is supplied from two locomotive-type boilers at 125 pounds pressure.

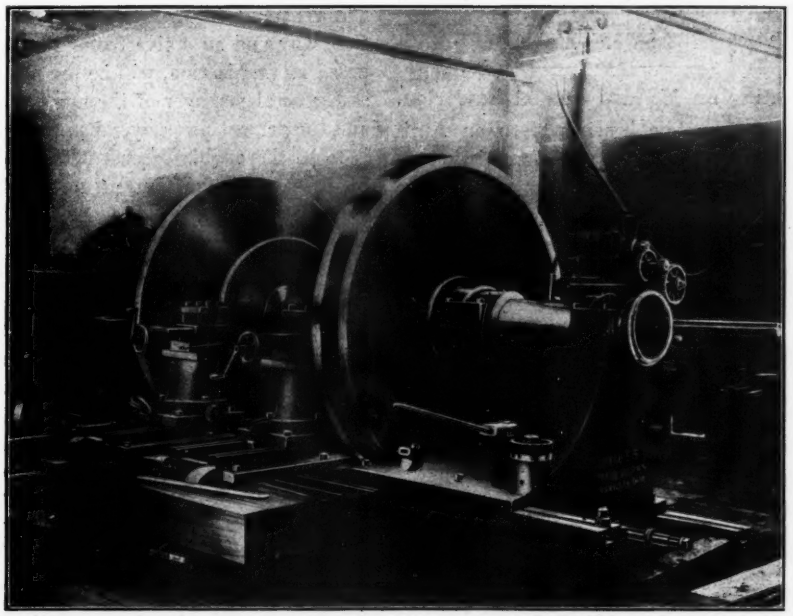
The entire electrical equipment was installed by the local operating force of the company under the direct supervision of W. F. Kapp, superintendent of shops and machinery, to whom we are indebted for the information given herewith. From the time of the original installation no interference whatever has been experienced by the failure of any of the power-plant equipment or the motors. The only interruption of service which has occurred was the occasional blowing of a

fuse when some one of the motors was started improperly.

The switchboard, as shown herewith, represents standard Westinghouse practice for low-tension, three-phase, alternating-current circuits. There are two generating panels, one exciter panel, and two feeder panels, all of blue Vermont marble. Ammeters are provided for all three legs of the circuits on each generator panel, with a voltmeter for each generator as well as a voltmeter and ammeter for the exciter. While the lighting and power circuits are kept separate, the switchboard is so arranged that these circuits can be supplied from either or both of the generators, as may be necessary.



MAIN GENERATOR AND EXCITER, BOULTON SHOPS.



DRIVING-WHEEL LATHE, BOULTON SHOPS.

The machine-shop equipment is particularly well arranged, both with respect to the machines and the driving motors and the natural lighting facilities. Several of the individually driven machine tools are shown herewith, clearly indicating the convenience of the motor drive, as well as the general cleanliness of the shop, as a result of the elimination of a large part of the belts. The accompanying table shows the different equipments used in the shops, including the woodworking department, the machine shop, the wheel-mounting shop and the blacksmith shop. In addition to the equipment shown on the table, should be mentioned a store-house elevator, operated by a ten-horsepower induction motor, and a Sturtevant fan in the punch shop, for use in connection with the heating system, driven by a ten-horsepower motor. The heating of the paint shop is done by a fifty-inch fan and heater coils, which are located in the roof trusses, the fan being operated by a 7.5-horsepower motor.

In connection with the installation of the forty-horsepower motor, driving the two boring mills, the wheel press and the double-head axle lathe, in the wheel-mounting shop, it should be noted that the original intention was to drive the entire machine-shop equipment from this one motor, but circumstances allowed a regrouping of the tools, so that this motor became available for its present work. It has ample capacity to allow considerable expansion in this department, when such proves to be necessary.

In the machine shops, the line shafts of the group drives present an unusual feature in the high speed at which they run. Standard practice usually gives a maximum line-shaft speed of approximately 200 revolutions per minute, but here one shaft runs at 400 revolutions per minute and the other three at 300 revolutions per minute. No trouble whatever has resulted from these unusual speeds.

The planing mill, an interior view of which is shown, is especially interesting owing to the manner of mounting the motors. In the extension of the shop plant it became necessary to fill in to a considerable depth the ground on which the planing mill is situated, in order to bring the floor level up to a grade. It was decided not to fill in the space immediately beneath the building, but to leave this portion as a basement, utilizing the space to mount the motors and such shafting as is necessary to operate the various machines. The motors are suspended from the lower side of the floor beams and

connected to the machines or shafting which they operate by means of a flexible chain. The method of support is clearly shown in one of the illustrations.

This solution of the motor-drive question has resulted in a planing mill which is practically free of obstructions, with the exception of the tools themselves and such material as may be in process of manufacture, the only motors above the floor being the one on the traversing bed planer, as illustrated, which is driven by a ten-horsepower Westinghouse induction motor mounted directly on the machine, and the one above the floor line driving the fans which take care of the shavings. This latter is situated in the roof trusses. The blast and exhaust pipes drop from the trusses directly to the machines which they serve.

BOULTON SHOP EQUIPMENT.

Driven Machine.		Motor.		Location.
Kind.	Size.	Horse-power	Kind of Drive	
Planer	36"x11"	7.5	Individual	Machine Shop
Driving-wheel lathe	90"	20	"	" "
		3	"	
Shaper	24"	7.5	"	" "
Boring mill (horizontal)	....	5	"	" "
Planer	....			
Wheel press	...	10	Group	" "
Drill press	....			
Drill	....			
Boring mill	44"			
Lathe	35"			
Lathe	24"	15	"	" "
Guide grinder	....			
Lathe	43"			
Lathe	24"			
Turret lathe	16"	10	"	" "
Drill press	....			
Emery grinder	....			
Three lathes	24"	5	"	" "
Punch and shear	....			
Two bolt threaders	....			
Grindstone	....	7.5	"	Blacksmith Shop
Bolt header	1½"			
Drill press	24"	10	"	" "
Pipe threader	4"			
Two tool grinders	....	3	"	Tool Room
Fan	30"	3	Individual	Blacksmith Shop
Two boring mills	44"			
Double-head axle lathe	24"			
Wheel press	250 tons	40	Group	Wheel-mounting Shop
Tool grinder	24"			
Flue tumbler	100 flues	10	Individual	.....

PLANING-MILL EQUIPMENT.

Woodworking Tools.		Motor.	
Kind.	Size.	Horse-power.	Kind of Drive.
Band saw	42"	7.5	Individual.
Car-sill tenoner and gainer	12"	7.5	"
Cut-off saw	40"	15	"
Four-side molder	10"	20	"
Double cabinet-makers saw	24"	15	"
Universal planer	12"x30"	40	"
Jointer	24"		
Double-head shaper	....		
Lathe	20"	20	Group
Sash sticker	....		
Jig saw	.. .		
Three Tool grinders	....		

The refuse from the machines is collected by means of a fifty-inch fan and drawn to the boiler room by means of a second fifty-inch fan. Both fans are driven by forty-horsepower induction motors.

The length of time which the plant has been in service has given an opportunity to prove or disprove the claims made of the advantages of electric drive. The results of the equipment at Boulton have been a splendid justification of the foresight of the men responsible for the installment at a time when the question of the suitability of electric power for railroad shops was much discussed. No one is more enthusiastic for the use of motor drive than those officials of the Richmond, Fredericksburg & Potomac Railroad, who installed and have since operated this equipment.

The entire electrical installment was made with Westinghouse Electric and Manufacturing Company apparatus.

Hearing on McAdoo Tunnel Extension.

At the public hearing given on April 23 by the Public Service Commission on the form of contract to be used by the Hudson & Manhattan Railroad in the extension of its line from Thirty-third Street and Sixth Avenue to the Grand Central Station, New York city, E. P. Wheeler, representing F. R. Pembleton, attacked the financial organization methods of the Hudson companies and suggested an amendment to the contract, providing that all future issues of securities by the companies should be under the absolute control of the commission.

A. A. Gardner, of the Interborough, proposed a more definite wording in that part of the contract relating to the location of the station at the Grand Central Station. Gustav Schwab and a representative of the City Club appeared for their respective organizations in favor of the proposition. Mr. McAdoo said in answer to the opposition previously expressed: "The company is compelled to accept the proposition and contract as it is, since the statement regarding the financial structure and condition of the company has been filed with the proper authorities and will show the errors in the attacks on the company. The company is prepared to execute the contract in such manner as to conserve the public interests."

Regarding a statement that it had cost the Hudson companies much more per mile to construct their tunnel than it had the Interborough, Mr. McAdoo said: "The figures submitted for comparison were not made up on the same basis at all, and it costs much more to tunnel under the water as a general proposition than to do such work on land."

Camden & Trenton Railway Reorganized.

A complete reorganization of the Camden & Trenton Railway Company, which went into a receiver's hands in February, 1908, has been decided upon by the committee representing the first mortgage and the general mortgage bondholders of the company, and an agreement whereby the reorganization is to be effected has been signed. The new company will be known as the Riverside Traction Company, with an authorized bond issue of $1,500,000, an authorized issue of $1,100,000 of common and $400,000 preferred stock.

A. Merritt Taylor, president of the Philadelphia & West Chester Traction Company and an active factor in the proposed reorganization, will be the president and general manager of the new company, and the present property, when taken over, is to be thoroughly reconstructed and put in first-class condition at an estimated cost of $500,000.

Illinois Central to Use Telephones for Train Dispatching.

The Illinois Central Railroad plans to substitute telephones for telegraphs for a large part of its work over the entire system. The Illinois Central has 2,500 miles ready for telephone dispatching and will have the entire 6,000 equipped later. Superintendent of Telegraphs Groce says all main lines will be dispatched by telephone within one year. Burlington has 1,400 miles so operated. Mr. Groce says: "We don't expect to save money, but there are other advantages. We will continue to telephone with the present force. This has passed the experimental stage."

Transmission and Distribution Data.

The regular midday meeting of the Chicago Electric Club was held in the grill-room of the Chicago Automobile Club on Wednesday, April 28. The address was on the subject, "Transmission and Distribution of Electricity for Light and Power in Large Cities," by D. W. Roper, assistant chief operating engineer of the Commonwealth Edison Company. Mr. Roper made a number of interesting points concerning transmission and distribution lines. He said that the pole lines, conduits and cables of the Commonwealth Edison Company, distributing electricity for light and power in Chicago and its environs, made up a total cost greater than that of the generating stations; in fact, it represented about one-third of the total investment. As far as comparative costs of overhead and underground distribution and transmission systems were concerned, the overhead was put in at about one-fifth the cost of the underground. These figures, of course, are approximate and vary according to the density of the network.

During the past five years the system of the Commonwealth Edison Company has been growing at a rate of about 17,000 kilowatts connected load per year. It is estimated that for every 1,000 kilowatts load increase there is installed about three miles of transmission cable. The growth of the twenty-five-cycle distribution system represents about fifty per cent of the copper installed, an average of thirty-five pounds per kilowatt. The average length of the company's transmission lines is about three miles.

In the downtown district, which represents largely the business center of the city of Chicago, the service is almost exclusively on the direct-current 115-230-volt system. The increase here has been about 3,000 kilowatts per year, but as the low voltage calls for a greater installation of copper, the average has been about 170 pounds to every kilowatt increase. Of this copper increase in the direct-current district, about three-quarters are in the feeders, the remaining one-quarter being in the mains and services. The average length of these feeders is about 1,500 feet. It has been worked out that for the same amount of copper about three-and-one-half times the load can be transmitted thirteen times the distance, using the twenty-five-cycle, 9,000-volt distribution in preference to the direct-current system.

The growth of the sixty-cycle system has been about 2,500 kilowatts per year. About two-thirds of the increase in the sixty-cycle system is underground, with an expenditure of about thirty-seven pounds of copper per maximum kilowatt. During the past five years the cost of copper has varied from twelve cents to twenty-six cents per pound; consequently the cost of installation has varied according to the price of copper and also according to the geographical distribution of the system, the density of the load and the locality of the load.

The total load generated last year was 120,000 kilowatts. One-half of this is delivered to the railway customers and about 107,000 kilowatts is on the twenty-five-cycle system. In the downtown district there is a connected load of about 40,000 kilowatts, one-quarter of this being within one-half mile of State Street. The direct-current load within this district is greater than the entire sixty-cycle load on the North Side, which amounts to about 18,000 kilowatts.

The company is installing the conduit system wherever this becomes feasible, and it has been estimated that for each pound of copper installed there is an equivalent duct-foot installed. This does not mean that there is one pound of copper in each duct-foot, but represents only a general average. The cost of conduit construction varies from fifteen cents per duct-foot to sixty cents per duct-foot, and in extreme cases, where constructional difficulties of an extraordinary nature are encountered, the cost will run as high as $1 per duct-foot. This year the company is making a very extensive investment installation, and for investment work alone the installation amounts to about $10,000 per working day at the present time.

Replying to a question, Mr. Roper stated that six years ago the company installed the first 5,000-kilowatt vertical-type turbine. Similar units have been installed from time to time since then, and at the present time four of the first units installed are being superseded by units of a similar type having a maximum rating on the new plan of 12,000 kilowatts for continuous operation. By making some mechanical changes in the boiler setting, increasing the grate area, and increasing the height of the stack the company is using the same boilers for the 12,000-kilowatt units as were used for the previous installations of the smaller units.

Replying to another question, Mr. Roper said that the 120,000 kilowatts was the station load, and that, figuring in all the losses, it might be assumed that there were 110,000 kilowatts delivered to customers.

There was a desultory discussion, in which a few further questions were asked. President Howlett called on Glenn Marston, of New York, and Mr. Marston spoke briefly concerning the relation of electrical men in general to the central-station business. Mr. Marston has been making a specialty for several years of compiling municipal statistics and has done some excellent work in addressing public organizations and assemblies with the purpose of bringing the central-station man's viewpoint into harmony with the viewpoint of the man on the street. Mr. Marston referred to the unwitting philanthropy which public-service corporations had brought about in the development of their systems, instancing the improved lighting of the city streets, the safeguarding of public thoroughfares by increasing the night illumination, and the elimination of a large proportion of child labor and sweatshop conditions by the introduction of electrically driven labor-saving machinery. He emphasized the importance of the supply men and other representatives of the electrical industry, bringing to the attention of both the central-station manager and the public the necessity for each getting the other's viewpoint. The whole problem, he said, of increasing the use of electricity lay in properly educating the consumers to an appreciation of the service which the public-service corporations rendered, and in turn getting the public-service corporations to appreciate the needs of the consumer and the necessity for dealing with him in an open-handed manner.

Massachusetts Trolley Suit.

E. D. Robbins, counsel of the New York, New Haven & Hartford Railroad Company, had a conference at the Department of Justice, Washington, D. C., with Attorney-General Ellis and United States Attorney French of Boston with reference to the suit brought by the Government in Massachusetts a few months ago to dissolve the merger of the trolley lines and prevent the acquisition of the Boston & Maine Railroad by the New York, New Haven & Hartford Railroad Company. A demurrer to the bill is pending. The object of the conference was to arrange for a speedy disposition of the case. The representations as to the position of the company were taken under advisement by the department.

REVIEWS OF CURRENT ENGINEERING AND SCIENTIFIC LITERATURE

ELECTRIC SINGEING OF THREAD.

Singeing is an operation practiced in the textile industry for the purpose of removing the down and small fibers with which the thread is covered, by passing it rapidly through a gas flame. This process is uneconomical, more than ninety-six per cent of the heat produced being wasted, and the work is done irregularly. The principal disadvantage of the method is, however, that it produces large quantities of injurious gases and dust in the work rooms and makes them extremely unhealthy. The electrical method of singeing does away with these defects almost entirely, the apparatus being so arranged that little heat and no injurious gases are liberated into the work room, the gases being aspirated together with the products of combustion. In the process developed by Mr. Gin, the heat of an electric conductor brought to incandescence by an electric current is utilized for singeing the thread. The conductor is a platinum tube, slotted on one side in order to permit the easy introduction of the thread. One end of the tube is mounted on a spring to prevent its buckling, when it is heated and expands. The thread may be made to pass through two or more such tubes in succession. For heating the conductor an intense current of low pressure is necessary. If alternating current is available, a step-down transformer is employed and all the tubes of one loom are connected in parallel, so that the breaking of one of the elements will not interrupt the work of the whole loom. Different degrees of heat, which are necessary according to the speed of the thread, are obtained by varying the number of turns in the primary winding of the transformer, and the use of a rheostat in the circuit is thus avoided. The process has been in successful operation for some time.—*Translated and abstracted from L'Electricien, Paris, March 20.*

THE INFLUENCE OF DAYLIGHT ON THE DISTANCE OF WIRELESS TRANSMISSION.

In order to obtain an explanation of the phenomenon observed by Marconi, that daylight greatly diminishes the distance to which it is possible to transmit wireless messages, Dr. Mosler has carried on investigations for over a year and made tests between several stations in Germany. Marconi believed the effect to be due to the dissipation of the negative charge of the antennæ by sunlight. If the decrease in the distance of transmission is caused by influence on the transmitter—that is, by the so-called silent discharge by daylight—then the damping of the air wire would have to show different values, and resonance curves taken by day and by night would show considerable variation. The experiments therefore aimed at determining the damping of the antennæ at different times of the day and year, but no variation could be noted. Between stations up to 300 kilometres apart there was no appreciable difference in the intensity of signals transmitted by day and by night. However, a considerable influence on the intensity was observed, when wave impulses from the Poldhu station, which was about 1,100 kilometres distant, were received at the station of the experimenter. But, also, this phenomenon shows that there can be no influence on the transmitter, for in such case the change would manifest itself also at short distances. It proves, on the contrary, that absorption must take place in the intervening space, and that it increases with the distance. Therefore it must be assumed that the propagation of the energy, when it is transmitted to long distances, takes place in air strata of considerable height.—*Translated and abstracted from Elektrotechnische Zeitschrift (Berlin), April 1.*

FIRE RISKS OF ELECTRIC INSTALLATIONS.

We have more than once pointed out that the danger of electricity lies in its safety. It is used in places where nobody would dream of using a naked gas light; for instance, in the manufacture of explosives, and in coal mines. If a man fills a balloon with hydrogen, he uses electricity for lights and fans. Consequently, it often has to face conditions which can only be described as picked. The London County Council fire-brigade report for 1908 shows that out of 3,238 fires, some 357 were connected with gas and 130 with electricity. The gas journals have been very jubilant over this. They ask us to consider for one moment the proportion of gas jets to electric lamps in London, and then to draw our own conclusions. The conclusions are ridiculously obvious. Electric lighting is by no means as widespread as gas lighting, that is true. This very fact, however, brings with it a corollary. The proportion of people who have adopted electric lighting for safety because they work under dangerous conditions is all the more considerable. If it be thought that there is already imminent danger of combustion or explosion in any trade, that is where electric light is chosen without hesitation.—*Abstracted from Electrical Times (London), April 8.*

ELECTRO-MECHANICAL PROPULSION FOR SHIPS.

The following is part of an abstract in the *Mechanical Engineer* (Manchester, Eng.) of a paper recently read before the Newcastle local section of the Institution of Electrical Engineers: Accepting the view that turbines will be exclusive steam motors of the future for marine work, it is evident that for slow and intermediate-speed ships the compromise effected in fixing the speed of rotation to suit both turbine and propeller must limit the combined efficiency to some extent so long as the direct drive is used. In general, for such boats the propeller needs a lower speed than the turbine for maximum efficiency, and one means of maintaining this condition is to have turbines driving dynamos direct, which deliver their power to electric motors coupled to the propeller shaft, using the best speed for each drive, and obtaining maximum over-all efficiency. It is somewhat difficult to estimate the relative costs and weights of the machinery in each case, as so much depends on the type of vessel, but it is probable that electrical propulsion could never be economical for large high-speed boats. But for smaller and slower ships, where the weights and steam consumption are relatively higher, it might compare very favorably with the simple turbine system.

The type of motor suitable for such work seems to be the squirrel-cage induction motor; but it is rash to make any definite assertion at the present time. The conditions vary considerably with ships of different classes, but in general it may be assumed that the motor must be able to

run fairly efficiently at several speeds; commutators and slip rings are to be avoided if possible, and a large starting torque is not essential. These conditions would be satisfied by a squirrel-cage induction motor, which would not necessarily have slip rings for the insertion of resistance in starting up, but must have several windings on the stator so as to give at least three maximum speeds. In this way the turbines would be nearly always running at maximum power (since a part of the plant could be shut down) and the motors at approximately maximum efficiency, and the huge loss of economy in reducing the speed of a turbine boat would be largely avoided, while the absence of astern turbines would, of course, be a great point in favor of the system. The system just described is not by any means the only possible solution of electric propulsion. Both in America and Germany it is proposed to adopt single-phase commutator motors, but the use of a commutator at sea can hardly help being a source of continual trouble. Other systems, such as combining the direct drive with motors on the same shaft obtaining their power from low-pressure turbo-generators, have been suggested. Electrical propulsion has also much to combat, many rival systems having been proposed, and possessing strong advocates.

AN IDEA NEVER REALIZED.

In the early days of electrical applications suggestions were made that thermo-electricity would enable us to "work steam engines without fuel." Of course, a little investigation showed the coal got there all the same, the idea really being the utilization of a waste product—heat not previously used. We all know the thermopile with its bars of bismuth and antimony, and how sensitive it is to a difference of temperature at the two ends. This was the idea. The bismuth-antimony combination "will yield large quantities of electricity, with a very trifling difference in the temperature of the two ends, and as electricity in large quantities produces intense heat," this heat may be rendered available for the uses of the steam engine. Ordinarily when steam is finished within a steam engine some of the heat imparted to it remains. Hence, if this steam were led to impinge on one end of a thermopile the other end of which was kept at a much lower temperature by a stream of cold water, large quantities of electricity could be generated, and by means of suitable apparatus be made to generate more steam—a kind of perpetual motion. First, use your steam, then employ exhaust with its waste heat to generate electricity, and with this raise more steam. It is not, however, suggested that in any way all the original heat could be utilized, so the idea does not run counter to the conservation of energy. It is a suggestion we never remember to have seen followed up. Is there anything in it? Can the heat unit obtained originally from the coal be still further economically used in this way? If not, why not?—*Abstracted from The Electrical Engineer (London), April 9.*

ELECTRIC BAGGAGE CAR.

In January of the present year the Northeastern Railway of England inaugurated a new departure on its electrified system in Newcastle by introducing a combined parcel and fish car, electrically driven and controlled, and designed for express service. This vehicle is one of the first combined cars to be electrically driven in the United Kingdom. The car has four compartments, consisting of a driver's cab at each end with a separate division in the center for the carriage of both luggage and fish, the length of the car being fifty feet. The center and side couplers are placed on the headstocks. This arrangement enables the car to be coupled up either to an electrically driven or a steam-driven train without delay. The buffers are also arranged to conform to the two systems. The braking arrangements include the standard air brake and hand brake, the air for the air-brake system being supplied by an electrically driven compressor. The electrical equipment consists of four 125-horsepower British Thomson-Houston railway motors of the GE-66 type. They are of the same type as those with which all Northeastern electric trains are equipped. The system of control is similar to the Sprague Thomson-Houston multiple-unit train control originally installed on the Northeastern electric trains, but brought up to date. The automatic acceleration is governed from the master controller. The installation and electrical equipment is particularly noteworthy as being designed and carried out on strictly up-to-date lines. All cables are asbestos-covered, and are run in solid drawn-steel conduits screwed into cast-iron connection boxes wherever junctions are required. A bell mouth is provided where the cables leave the piping, and a rubber washer, making a perfectly tight joint, insures the conduit being entirely sealed. The car is lighted by six lamps in series. Duplicate signal and route lamps are also installed, arranged on a sliding base, so that in the event of one circuit failing, the duplicate set can be immediately brought into use. The car was built by the Northeastern Railway Company at its carriage works at York, the electrical equipment being supplied by the British Thomson-Houston Company, Limited, of Rugby.—*Abstracted from the Tramway and Railway World (London), April 1.*

TELEPHONE NOMENCLATURE.

Those who are much concerned with telephone-transmission problems find that confusion is continually occurring, owing to the use of the word "miles" in connection with units of standard cable. For instance, a certain circuit 100 miles long is equivalent to five miles of standard cable. Again, two telephone circuits are compared, and the audibility obtained over the first is equal to that obtained over twenty miles of standard cable, and over the second equal to ten miles of standard cable. We are of opinion that the confusion resulting from the use of the name of the unit of length might be avoided by adopting a name for the unit of standard cable, and that a suitable name would be "Pupin." In the case where local system circuits connect with trunk circuits we should then be able to say, "where the radial length of the junction circuit plus the radial length of the subscriber's circuit does not exceed nine miles the allowance is five pupins, where it exceeds nine miles the allowance is eight pupins." If the reader will repeat this, substituting "miles of standard cable" for pupins, he will realize how confusing the present practice is.—*Abstracted from The Post Office Electrical Engineers' Journal (London) for April.*

Chemistry Congress to be Invited to Meet in United States.

President Taft has appointed seven chemists to represent the government at a meeting in London May 25, and to invite the Congress of Applied Chemistry to hold its eighth meeting in the United States in 1912. The appointees are: Dr. Harvey W. Wiley, chief chemist, Department of Agriculture; Prof. Charles Baskerville, City College; Dr. Leo Baekeland, chairman, American Chemical Society; W. L. Dudley, professor of chemistry, Vanderbilt University; Dr. W. H. Nichols, president of the General Chemical Company; Prof. Morris Loeb, president of the Chemists' Club; Albert Plaut and Dr. Maximilian Toch.

INDUSTRIAL SECTION

ILLUSTRATED DESCRIPTIONS OF NEW AND STANDARD ELECTRICAL AND MECHANICAL APPARATUS

The DuBois Tandem Gas Engine.

The DuBois Iron Works, DuBois, Pa., makes a large range of engines of from five to 375-horsepower capacity of the throttling, single-cylinder, tandem, and twin-tandem types.

The following article describes some of the principal mechanical features, many of them unique, of the DuBois tandem engine, and the producer plant by which it is most economically operated.

The main-frame construction is very substantial and massive, the frame, cylinders, and intermediate distance-piece being fitted to each other with circular necks, and recesses concentric with the cylinder bore. Each cylinder rests on a pedestal bolted to the bedplate.

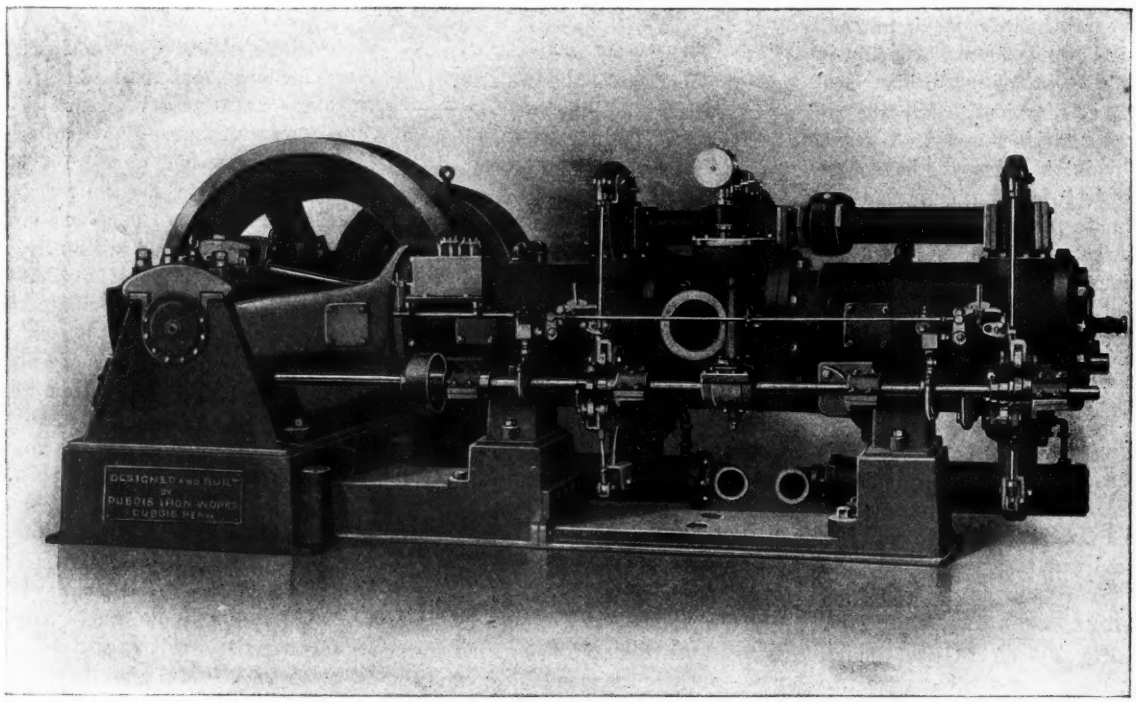


FIG. 1.—VIEW OF EIGHTY-HORSEPOWER TANDEM GAS ENGINE.

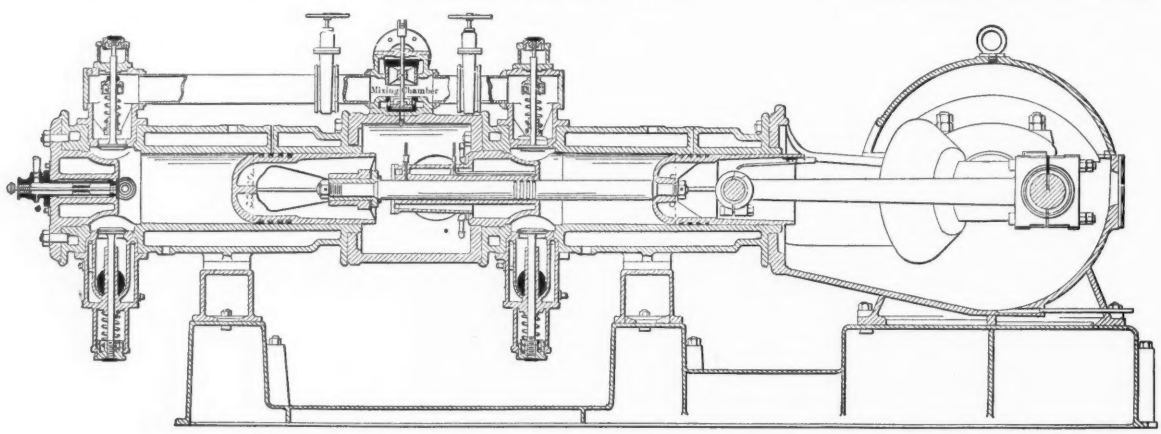


FIG. 2.—CROSS-SECTION THROUGH DUBOIS EIGHTY-HORSEPOWER TANDEM GAS ENGINE.

The valves, electric igniters, governor, and, on the larger sizes, the self-starting device, are operated by a longitudinal layshaft, driven from the crankshaft by bronze spiral gears, running in an oil bath.

The pistons are designed with convex heads, which permits of a longitudinal expansion, thus lessening the expansion toward the cylinder walls. The convex-headed piston is also much lighter and has less friction in the cylinder than a flat-headed piston of the same external dimensions and strength.

The crankshaft is forged solid with the

crank webs and pin, and is provided with balancing weights on the ends of the webs opposite the crankpin.

The connecting rod is a solid steel forging with ends split and bolted together, removable crankpin bearing of babbitt, and bronze piston-pin bearing.

The front piston rod is provided with four split rings like those of the piston, and slides in an elongated sleeve between the pistons, thus dispensing with the

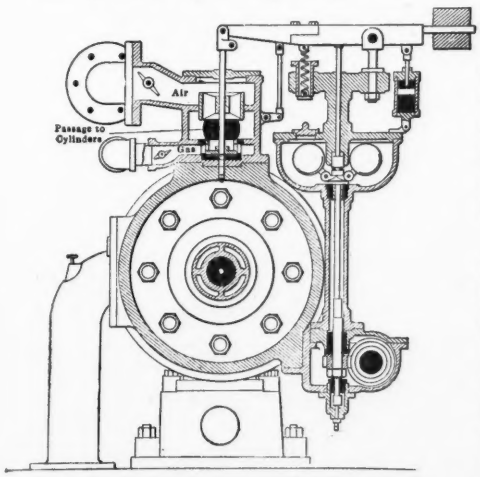


FIG. 3.—SECTION THROUGH MIXING CYLINDERS.

usual stuffing-box, with its attendant friction and annoyances.

Simple forged-steel poppet valves with beveled seats are used throughout the engine. The inlet and exhaust valves of each cylinder are opened by a cam, two push-rods, and four rocker arms, as shown in Fig. 1. The push-rods are provided with right and left-handed threads, so as to be adjustable while the engine is running. The valves are mounted in cages independent from the cylinder, so that the complete valve mechanism can be removed for inspection or repair.

One mixing-valve serves both cylinders, as indicated in Fig. 2, where the mixing-valve is shown immediately above the rear ends of the piston-rod packing sleeve. Fig. 3 shows more of the details. The valve stem carries two pistons, the upper one controlling the air supply by varying the space between its upper edge and the top of the cage, and the lower one varying the gas supply by means of ports in its wall and corresponding ports in the walls of its cage.

The proportion of gas to air is manually adjusted by means of valves in the supply passages, except when both the quantity and the quality of the mixture are to be varied simultaneously. For this condition the mixing-valve lever is also linked to butterfly valves.

The mechanical mixture control is not necessary, except when running on very lean gases, such as producer, coke, and charcoal gas. The mechanism is usually adjusted to give the best mixture proportions at full rated load, but a wide range of adjustment is practical. Fig. 3 shows this arrangement. Sometimes the inlet valve is designed as a cut-off valve, as when rich gases are available. This construction is often extremely serviceable in electric plants or where engines are required to operate in parallel.

Another special feature is the auxiliary exhaust, which consists of a series of accurately drilled holes through a rib connecting the water-jacket wall to the cylinder barrel, on the left side of each cylinder. This is shown in Fig. 2. This exhaust is uncovered by the piston near the end of its stroke and serves to reduce materially the warping, pitting, and burning of the exhaust poppet valves.

The fly-ball governor is driven by a spindle through cut spiral gears from the layshaft, and the balls and sliding member are enclosed in a stationary housing. The governor gears are located between the forward cam and the main shaft, or between two layshaft bearings. The governor is provided with a hand-adjustment device that will increase or decrease the revolutions while the engine is running.

Igniters are of the mechanical make-and-break type. The trip mechanism for each igniter is driven by an eccentric on the layshaft. Timing is accomplished by means of a vertical handle which raises or lowers the finger that trips the igniter and thereby alters the point of ignition. A reach-rod connects both igniters, and adjustment of this rod to the right or left retards or advances the timing of both igniters simultaneously, a feature of special advantage when starting the engine. This is shown in Fig. 1. An extra igniter is supplied with each engine to provide against shutdowns.

A force-feed oiling system is used for the cylinders and intermediate hands, and a central gravity-feed or an individual oil-cup system for the rest of the engine.

The engine is equipped with a valve in the head of the rear cylinder for starting with compressed air.

The producer is of the automatic suction type, in which the gas is automatically generated by the suction of the engine in amounts corresponding to its load.

A diagrammatic sketch of the complete tandem engine and producer plant is shown in Fig. 4.

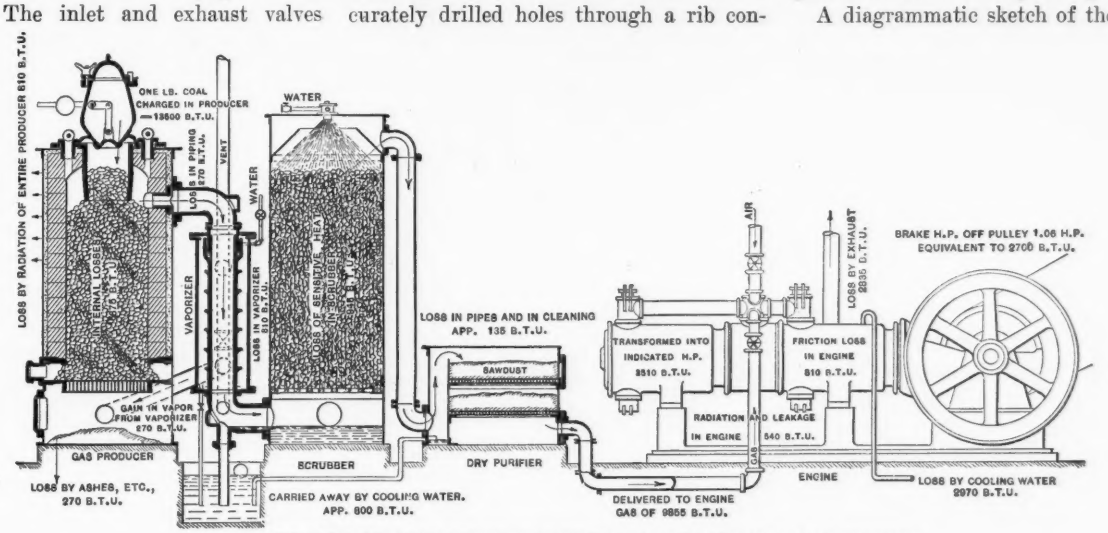

LOSS BY RADIATION OF ENTIRE PRODUCER 610 B.T.U.
ONE LB. COAL CHARGED IN PRODUCER —13500 B.T.U.
WATER
VENT
LOSS IN PIPING 270 B.T.U.
WATER
INTERNAL LOSSES 270 B.T.U.
VAPORIZER
LOSS IN VAPORIZER 810 B.T.U.
SENSIBLE HEAT IN GAS 1350 B.T.U.
GAIN IN VAPOR FROM VAPORIZER 270 B.T.U.
GAS PRODUCER
LOSS BY ASHES, ETC., 270 B.T.U.
SCRUBBER
CARRIED AWAY BY COOLING WATER. APP. 600 B.T.U.
LOSS IN PIPES AND IN CLEANING APP. 135 B.T.U.
SAWDUST
DRY PURIFIER
DELIVERED TO ENGINE GAS OF 9855 B.T.U.
AIR
LOSS BY EXHAUST 2835 B.T.U.
BRAKE H.P. OFF PULLEY 1.06 H.P. EQUIVALENT TO 2700 B.T.U.
TRANSFORMED INTO INDICATED H.P. 3510 B.T.U.
FRICTION LOSS IN ENGINE 810 B.T.U.
RADIATION AND LEAKAGE IN ENGINE 540 B.T.U.
GAS
ENGINE
LOSS BY COOLING WATER 2970 B.T.U.

FIG. 4.—SKETCH OF COMPLETE PRODUCER GAS PLANT AND GAS ENGINE.

Reduction in Cable Rates.

The Central & South American Telegraph Company announces that, beginning May 1, the rates to Ecuador, Peru, Bolivia and Chile have been reduced to $1 per word.

Tariff on Carbons.

Considerable interest is centered just now upon the probable outcome of the proposed tariff legislation on arc-light carbons. The situation in a nutshell seems to be that the importers desire a reduction of the duty as imposed in the Dingley Bill, whereas the American manufacturers contend that they must have equal or better protection to enable them to compete with the German and French factories. The Payne Bill proposes a duty of thirty-five per cent ad valorem, and the Senate Finance Committee recommends a duty of seventy cents per 100 feet.

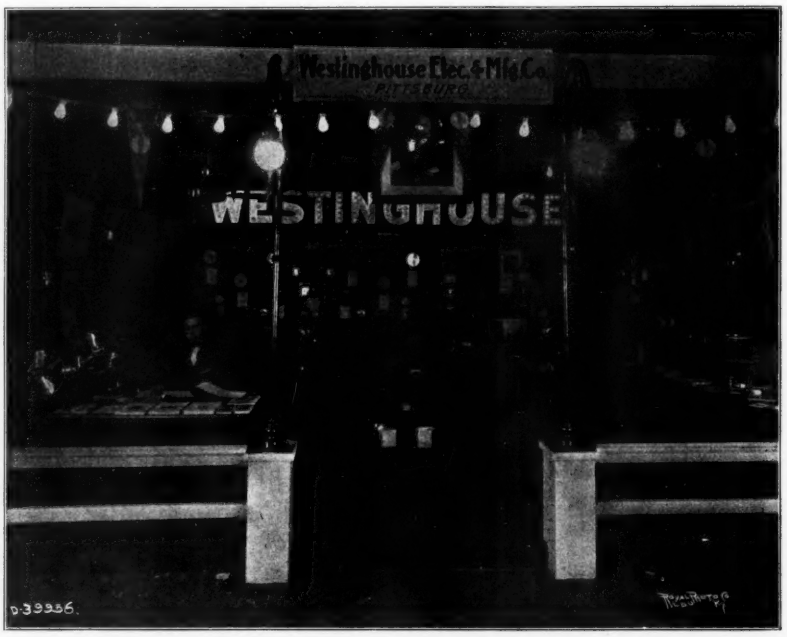
The controversy between the importers and domestic manufacturers has waxed pretty warm, and naturally some weird if not exaggerated statements have been made. One of these reflects directly upon the ability of American manufacturers to produce the goods, and that is the contention of the importers that neither flaming arc carbons nor certain kinds of high-grade carbons can be produced in the United States. This is stated not to be the case, and that American manufacturers are today producing millions of carbons for all types of flaming lamps and for what might be termed special lamps, such as projectors, moving-picture apparatus and searchlights. It is claimed by the American manufacturers that there are no lighting carbons manufactured in the European countries that are not made here, and as to whether or not they are successfully made can best be answered by the statement of the importers that only about fifteen or twenty per cent of the carbons used in this country are made abroad.

Those interested directly in foreign carbons say that American cities are not as well lighted as European cities on account of better carbons being used abroad. There is a great difference, however, in the arc-lamp practice of Europe and the United States. The series open arc lamps of the Brush and kindred types as well as the long-burning enclosed types are distinctively American and rarely found in European countries, and it is about as reasonable to lay the difference in general illumination to a difference in the quality of carbons as it would be to place the responsibility upon the different kinds of wire used in carrying the current.

Just what effect the proposed legislation will have on prices is somewhat difficult to conjecture. The importers contend there will be an advance in prices should the Senate Bill become a law, while on the other hand the American manufacturers assure us there will be no such advance, but that the tendency will be toward a lower basis whenever manufacturing costs will permit.

Westinghouse at the Louisville Show.

One of the most attractive and complete exhibits at the Louisville Electrical Show was the booth of the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa. This large space was comfortably and tastefully furnished, decorated with pennants and photographic enlargements of the great shops at East Pittsburg, and illuminated by Westinghouse-Nernst and Westinghouse tungsten lamps. The large line of manufactures of the Westinghouse companies was represented by examples of a variety of apparatus for industrial, domestic and central-station uses. The display of power and railway apparatus included transformers, circuit-breakers, series transformer, potential transformer, lightning arrester, fuse blocks, fuses, release switch, drum-type controller, and trolley-line material. Among the instruments exhibited were a portable polyphase indicating wattmeter, single-phase polyphase and direct-current wattmeters, ammeters, voltmeters, recording graphic wattmeter, synchroscope, integrating wattmeter and static ground detector. Mill-type multiple, series, and metallic-flame arc lamps were shown, supplementing the divisional illumination of Nernst lamps, and tungsten and carbon incandescent-filament lamps. The office, shop and home electrical devices included stationary and oscillating house and desk fans, telephone-booth fans, electric irons and tailors' goose irons, electrically heated glue-pots, jewelers' buffing and polishing motors, sewing-machine motors, industrial motors of many sizes and for a variety of purposes, complete with starting and control equipment, and an automobile-charging outfit. The Westinghouse representatives at the Louisville Electrical Show were J. A. Brett, C. Gilliand and Frederick Sturm of the Cincinnati district office, and C. A. Klemm and J. N. Baker of the Louisville office.



WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY AT THE SOUTHERN ELECTRICAL AND INDUSTRIAL EXPOSITION.

Electric Garage in Boston.

The Boston Electric Garage Company has been organized at Boston, Mass., to erect a large garage exclusively for electric vehicles. N. Rommelfenger, who was with the Edison Electric Illuminating Company as storage-battery expert for the past fifteen years, is president of the company, and James A. Binney is treasurer. In addition to the garage business, the company has the agency for the Detroit electric car, made by the Anderson Carriage Company. The garage will be of steel, fireproof construction, four stories high, with a deep basement. A complete equipment will be installed for the storing, repairing and charging of all sorts of electric vehicles.

The Adams-Bagnall Regenerative Flame Lamp.

The Adams-Bagnall Electric Company, Cleveland, Ohio, announces something entirely new in arc-lamp designing in this country. The accompanying illustration shows the new regenerative flame lamp which this company has, with its usual conservatism, placed on the market after thorough testing had demonstrated that it was a commercial success.

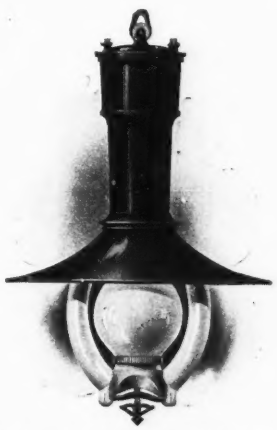
This lamp produces the characteristic orange ray of the ordinary flame arc with an even greater intrinsic brilliancy. It cannot, however, be considered in any other sense of the word a lamp of this type. The carbons are placed vertically one above the other, and enclosed with double globes, the inner globe being clear and the outer globe opalescent. The inner globe cap-top contains an opening communicating with two side tubes, which allows a free circulation of the gases in the globe, permitting them to return to the bottom of the globe, which is also open. The gases upon becoming reheated by the arc repeat this cycle of operations. The chemicals, in gaseous form, are thereby used over and over again, intensifying the light, and thus justifying the name of "regenerative." Both inner and outer globes are tightly sealed at both top and bottom to prevent ingress of air.

The lamp is designed so as to eliminate all shadows. The lamp-case is rugged and waterproof. The length over all is thirty-six inches, and the weight complete, including globe and reflector, forty pounds. The reflector is twenty-four inches in diameter, and is made of No. 22 gauge sheet steel, heavily enameled both top and bottom.

Tests show an average life of seventy hours for each carbon. These carbons have been produced after exhaustive research, as the existing forms of impregnated carbons, it is stated, were found to be unsuited to this type of lamp. The regenerative carbons are mechanically strong and will stand rough handling with little danger of breakage. The upper or negative electrode is eighteen inches by five-eighths inch in diameter, and is composed principally of pure carbon. The lower, or positive, electrode is seven inches long by seven-eighths inch in diameter, and consists of a core, star-shaped in cross-section, the radial spaces or grooves being filled with a chemical composition which possesses the property of maintaining a brilliant orange ray independently of the presence of oxygen.

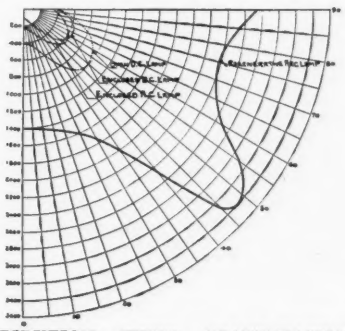
The light produced is stated to be remarkable for its harmless effect on the eye, for its steadiness and penetrating qualities.

The accompanying diagram of the light distribution is submitted as showing the increase in light intensity with the regenerative lamp. This diagram indicates



ADAMS-BAGNALL "REGENERATIVE" FLAME ARC LAMP.

a maximum of 2,800 candlepower with the point of greatest brilliancy almost directly below the lamp. The maximum candlepower is 3,400—at an angle of about forty degrees from the horizontal. The lamp gives a mean lower spherical candlepower of 2,200 with a consumption of 550 watts. The standard current consumption is five amperes, and these lamps



DISTRIBUTION WITH ADAMS-BAGNALL "REGENERATIVE" FLAME ARC LAMP.

can be furnished for operation either in multiple on 100 to 120 volts, multiple series, two on 220 to 250 volts, or five on 550 volts, for either direct or alternating-current circuits.

The Western Electric Company Reports Encouraging Business Increase.

Improving with the first of the spring months, the business of the Western Electric Company for March made a better showing than any of the preceding months of the fiscal year, which began December 1, 1908.

March sales were at the rate of about $48,000,000 a year, and the rate for the four months ended with March was about $45,000,000 a year. Telephone sales continue to show a steady improvement, not only to the Bell companies, but to outside telephone companies. The greatest ratio of increase in the company's sales has been for some time in the sales to non-lessee companies, explainable by the fact that the Western Electric Company did not actively solicit this class of business until about a year and a half ago. Sales to non-lessee companies are fifty per cent larger for the period under consideration than for the same period a year ago. The rural-telephone branch continues excellent, and for the four months under consideration showed an increase of fifty per cent over the corresponding period in the preceding year. The electrical supply business also showed a steady ratio of improvement.

The Western Electric Company is still increasing the number of its employes, having added to its force about 2,000 men since the beginning of the fiscal year. It now is employing in all about 17,000 persons.

An Automatic Rail Switch.

An automatic rail switch, operated by the motorman through a lever controlled by a foot catch on the car, has been patented by Alfred Jobin, an employe of the Winnipeg Electric Street Railway Company, Winnipeg, Man. The company is equipping all its cars with the lever attachment, which costs $2, and its switches with this automatic device at a cost of $25 each. By the use of this invention the switch is changed from its former position each time the lever is worked by the motorman on a passing car. The saving in time and the practical immunity from derailments afforded are obvious advantages. R.

Railroad Electrification in Lapland.

The General Director of the Swedish State Railroads is authority for the statement that the electric power station for the proposed electrification of the state railroads in Lapland will be located at the Torne River. Regulating dams will be constructed at Tarakoski and Vorkakoski, and the power-station buildings will be at this latter place. The cost will approach $1,500,000. The expenditure on the line itself, including the rolling stock, is estimated at $2,250,000.

A New Table Push-Button Cord.

A new table push-button cord has been placed upon the market by the Belden Manufacturing Company, 194 Michigan Street, Chicago, Ill. These are two-conductor cords, each conductor made of stranded copper wire with two substantial cotton braids and an outer braid of green spun silk on mercerized cotton. The unique features about these cords are that they are cut to six-foot and nine-foot

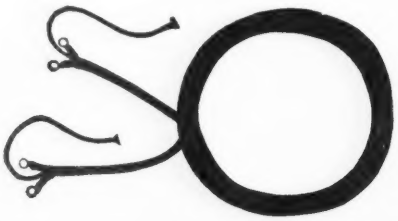


TABLE PUSH-BUTTON CORD READY FOR SHIPMENT.

lengths, as required, and supplied with terminals, bared and finished, all ready for use, each cord being coiled neatly and shipped in a paper carton. This makes a very attractive proposition for dealers, as the cords will keep clean indefinitely and the dealer is not bothered with having to handle and cut cordage to lengths. These cords should prove of interest to contractors and jobbers and should find a ready market.

United States Light and Heating Company Reorganized.

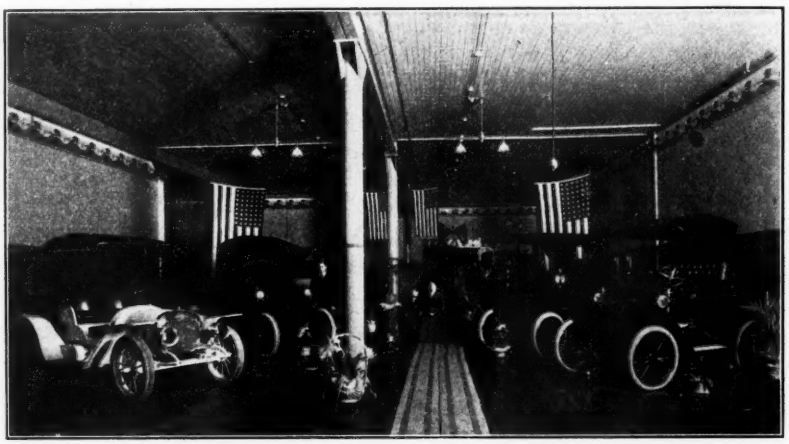
The reorganization of the United States Light and Heating Company, which owns the Bliss system of electric car lighting, the National Battery Company of Buffalo, and the United States Light and Heating Company of New Jersey, has been completed, according to an announcement made by Edwin S. Hooley, of Hooley, Learned & Company, and has entered into possession of its properties.

The new board of directors consists of E. S. Hawley, W. H. Silverthorn, president of the Railway Steel Spring Company; J. E. French, chairman of board of directors of the same company; C. A. Starbuck, president of the New York Air Brake Company; W. S. Crandell, with Hawley & Davis, bankers; T. P. Shonts, president of the Interborough-Metropolitan Company, and Newman Erb, president of the Wisconsin Central Railroad Company.

The officers are: W. H. Silverthorn, president; Jules E. French, first vice-president; Edwin Hawley, second vice-president; C. A. Starbuck, third vice-president, and W. S. Crandell, secretary and treasurer.

The Babcock Electric Carriage Salesroom.

The accompanying illustration shows the Toledo (Ohio) salesroom of the Babcock Electric Carriage Company of Buffalo, N. Y. The company announces that the 100-mile electric has actually arrived and it bears the name of "Babcock." Official non-stop runs of as high as 115 miles upon one charge of the battery, the climbing of grades at better than twenty



TOLEDO, OHIO, SALESROOM, BABCOCK ELECTRIC CARRIAGE COMPANY.

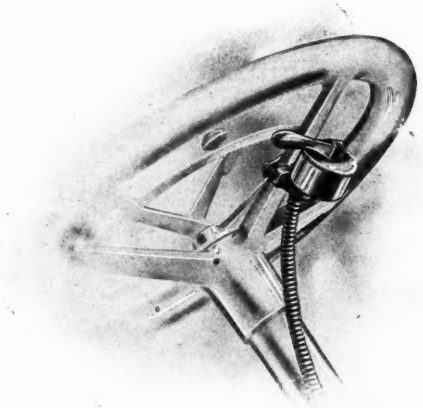
miles an hour, and the development of thirty-five miles an hour on level roads are everyday occurrences with the "1909 Babcock." The company is showing a wide range of "classy" models, from the Victoria and the Victoria phaeton, and the inside-driven Model coupe, down to the light, flexible runabout.

For an Electrical Quarter in Toledo, Ohio.

There is considerable agitation in Toledo just now over the threatened removal from the city of the General Electric Company, unless a portion of Mulberry Street is vacated. The company wants the city to vacate the street to permit the erection of new buildings and the enlargement of the plant, claiming that it is planned to spend at least $300,000 for improvements if the concessions asked are made. The property owners of Mulberry Street object strenuously to the vacation of the street, and the matter is in abeyance. An attempt will be made to present the company with another site, and there is also a movement on foot to make such concessions that all the different electrical concerns in the city can be induced to remove to the east side, where a sort of electrical center would be formed. At present nothing definite has been decided upon or done, and the excitement continues. H.

Steering-Wheel Switch.

The Connecticut steering-wheel switch is a neat little device which fills a long-felt want and will be appreciated by the driver of an automobile. It puts the ignition control under the right hand of the driver and may be manipulated without the hand leaving the wheel. Four different positions are provided as follows: "Off," "battery," "magneto" and "magneto and battery together," for different cars provided with two ignition systems, or it may be used with magneto or battery system alone. It is one-and-one-half



STEERING-WHEEL SWITCH.

inches in diameter and made entirely of brass, dust and waterproof. It is fastened by a bracket under one of the arms of the steering wheel and the controlling lever may be removed, making the car safe from interference during the absence of the driver. Two wires are used which are encased in flexible brass tubing and connected to the battery and magneto.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, APRIL 17.—The City of London Corporation has decided to purchase a second electrically-driven ambulance for use in the streets of London. At present there is one of these vehicles at work, in conjunction with an elaborate call system, every policeman having a key of the street boxes from which telephonic communication is possible to the ambulance station.

A short time ago the Commissioner of Police in London issued a notice to the effect that no new licenses would be granted for motor omnibuses whose weight exceeded three-and-one-half tons. This at once created some doubts as to the future of the company running the electric omnibuses in London, as owing to the extreme weight of the electric batteries it is impossible to keep the total weight below about five tons. In fact, it rather appeared that the future extension of the electric omnibus services in London was doomed. However, all doubts have now been set aside on this point, as the Commissioner of Police has agreed to regard the accumulators as fuel, in the same way that the petrol tanks of an ordinary motor bus are regarded as fuel. In this way the present size electric buses comply fully with the new regulations and no modifications will be necessary in future vehicles.

Despite the refusal of the London County Council, which is the authority for granting municipal loans in London, to allow the Marylebone Borough Council to borrow $40,000 for the purpose of converting a large portion of the gas street lighting in the borough to electric lighting, the Borough Council is actually proceeding with the work.

The hesitancy of the City of London Corporation to allow tramways across the Thames bridges in their area is being gradually broken down. Consent has been given to the widening of the Southwark Bridge with a view to a tramway passing over it. Such a decision would have been unheard of a few years ago. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, APRIL 17.—There has recently been put in operation an electric furnace plant for steel production at Flekkelfjord, Norway, using the Hjorth process. At present the furnaces are used entirely for the production of tool steel, but it is intended to manufacture steel for other purposes, such as plate, etc., in the near future. The material which is used in the process is Swedish iron.

A concession for a light electric railway in Austria-Hungary has been granted by the Minister of Railroads to a local company known as the Mährisch-Schlesische Railroad Company. The line is to run from Hruschau to the station of Oderburg, lying on the state railroad. The two well-known watering places of Johannisbad and Spindelmühle are to have electric-lighting plants, and these are expected to be finished for use during the coming season. In the last-named plant a steam turbine is to be used, coupled to a direct-current generator, with a storage battery operated in parallel. The already existing plant at Johannisbad is being transformed and enlarged, and it will use Diesel oil motors.

In the Algerian region the government is to erect a telephone line between Oran and Tlemcen and also between St. Barbe-du-Tlelat and St. Lucien. There is also to be installed a telephone line in the district of Constantine, between Barika and Mac Mahon, also a telephone-exchange system in the town of Barika.

A merger is announced for the two electric companies which have been engaged in the current supply for Naples, and the capital is to be increased to 16,000,000 francs. The new company proposes to erect a new hydraulic plant of 3,000 kilowatts capacity on the river Lete. A. DE C.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, MAN., APRIL 24.—The Manitoba Power and Electric Company has been incorporated with a capital of $100,000 and head office at Portage la Prairie, Man. The incorporators are W. H. Carter, A. H. Aldinger and A. J. Williams of Winnipeg, Man., and Chicago, Ill.

The most extensive power proposition ever suggested in Manitoba is now being planned by the Great Falls Power Company of Winnipeg, Man. The company has secured sufficient fall on various rivers to develop nearly 200,000 horsepower, which will be distributed to supply sixty-three towns in the province with light and power. P. M. Gillatt, manager of the H. M. Byllesby Company, Chicago, Ill., is one of the organizers of the projects, and states that the price of power at the points of development will be twenty dollars per horsepower-year, graduating down to fourteen dollars for users of 14,000 horsepower or more.

Arthur Anslow, Lumsden, Sask., will receive sealed tenders until May 8 for the construction of the Wascana Rural Telephone Company's system. R.

IMPORTANT DEVELOPMENTS.

(Special Correspondence.)

HYDROELECTRIC PLANTS FOR COLORADO—The San Luis Power and Water Company, recently organized by Denver (Colo.) capitalists with a capitalization of $1,000,000, proposes to erect large power plants and supply towns in the southern part of the state, besides being interested in irrigation projects.

BIG TRACTION COMPANY ORGANIZED—Articles of incorporation of the Cincinnati, Louisville, Lexington & Maysville Traction Company, with $10,000,000 capital stock, have been filed at Frankfort, Ky., with the State Railroad Commission and the Secretary of State by W. T. S. Blackburn, of Dry Ridge, Grant County, president of the company and one of its promoters. Mr. Blackburn remarked that the work of building the new traction lines will be started this year and rushed to completion.

ELECTRIC POWER DEVELOPMENT IN CALIFORNIA—Seven years ago the Northern California Power Company, of Redding, Cal., was selling 300 horsepower of electrical energy. Today the same company is marketing 13,600 horsepower. The company is not able to keep up with the demands. It is now constructing a power plant at Inskip, on South Butte Creek, to develop 9,000 horsepower more. Far down the stream and below the great dam under construction another plant of 16,000 horsepower capacity is to be erected as soon as the Inskip plant is completed. The company at present has three plants with the capacities indicated: Volta, 9,000 horsepower; South Power House, 5,500; Kelaic, 4,500. The electric process iron smelter at Heroult, which is to start up next week, will call for 2,000 horsepower at the start.

LIGHT AND POWER COMBINE—Edwin S. Hooley, of Hooley, Learned & Company, announces that the reorganization and consolidation of the United States Light and Heating Company has been perfected, and that the company has entered into possession of its various properties. The new company owns the Bliss system for electric car lighting; the National Battery Company, of Buffalo, N. Y., and the United States Light and Heating Company, of New Jersey. Negotiations are pending for acquiring other plants. The directors of the new company are E. S. Hawley, J. E. French, C. A. Starbuck, W. S. Crandell, Theodore P. Shonts and Newman Erb. The officers are: W. H. Silverthorn, president; J. E. French, first vice-president; E. S. Hawley, second vice-president; C. A. Starbuck, third vice-president, and W. S. Crandell, secretary and treasurer. The company is capitalized at $17,500,000, of which $2,500,000 is seven-per-cent cumulative preferred stock. There are no bonds.

LONG-DISTANCE POWER TRANSMISSION IN THE WEST—Arrangements have been completed by Denver capitalists to construct a 300-mile power transmission line from the plant of the Nevada-California Power Company on Bishop Creek, in California, to the copper mining camp at Ely, Nev. It is said that this line, when completed, will carry electricity a greater distance than any line yet constructed. The company during the past year has been engaged in expending $600,000 for enlarging its power plant on Bishop Creek, and this work is rapidly nearing completion. The company, which was incorporated in Wyoming two years ago with $5,000,000 capital stock, has organized the various electric-light systems in Goldfield, Tonopah, Bullfrog and surrounding towns, into one company, and supplied them with power from the one plant in addition to furnishing power to the various mining camps. The company has issued $3,000,000 in bonds, of which the International Trust Company, of Denver, Colo., is trustee, and it is claimed that the company is already earning twenty-five per cent per year on its investment. The surplus over six per cent dividends, however, is being applied to the redemption of its bonds until they are all called in.

LIGHTING AND POWER.

(Special Correspondence.)

FLATONIA, TEX.—Paulus & Rhodes will install an electric-light plant here. W.

HYDRO, OKLA.—This city is about to install a municipal electric-light plant. W.

FORT WORTH, TEX.—This city has voted $50,000 in bonds for the extension of the electric-light service. W.

HOUSTON, TEX.—The Brown-Woods Electric Company has been incorporated with a capital stock of $10,000. W.

PASADENA, CAL.—Bonds amounting to $150,000 have been issued here for the extension of the electric-lighting system. A.

KELLOGG, IDAHO—The Washington Water Power Company has been granted a franchise for an electric power line in this city.

EL DORADO SPRINGS, MO.—B. F. Proctor has been given a franchise to install an electric-light system here. Work begins at once. W.

CHICO, CAL.—The Sierra Electric Power Company has been granted a franchise to erect an electric power-distributing system in this city. A.

CHEHALIS, WASH.—The Valley Development Company has begun work on its electric power project at Packwood Lake, in the Cascade Mountains.

OROVILLE, CAL.—The Sierra Electric Power Company has been granted a franchise for a power transmission system along certain highways in Butte County.

RED BLUFF, CAL.—The Sierra Electric Power Company has been granted a franchise for an electric power line from its plant on Battle Creek through Tehama County.

RED BLUFF, CAL.—The Butte & Tehama Power Company has been incorporated here, with a capital stock of $1,000,000, by Luke McDonald, L. A. McIntosh, R. S. Kitrick, J. E. Frick and Leon Bly.

ALBANY, N. Y.—The Caroga Electric Power Company, of Glens Falls, has been incorporated with a capital of $50,000. James H. Cross of Johnstown, Theodore D. Cross of Sandy Hill and J. Ward Russell of Glens Falls are the directors.

WAKE FOREST, N. C.—A unanimous vote was cast for the issuing of bonds for the building of an electric-light plant for the college and town. It is expected to have the plant in operation by September 1. L.

ALBANY, N. Y.—The Niagara-Oswego Power Company has been incorporated with a capital of $20,000, and these directors: Simon B. Storer of Syracuse, Eugene M. White of Phœnix and M. Stanley Powell of Fulton.

CADILLAC, MICH.—The Western Michigan Power Company has purchased 1,040 acres of land for flowage rights along the Manistee River in Greenwood and Liberty townships, Wexford County. The price paid was $10,000.

SPOKANE, WASH.—The Northern Idaho & Montana Power Company has purchased two sites in this city, where substantial buildings are to be erected, to house new machinery for increasing the capacity of the company's plant.

BRIDGEPORT, CONN.—The United Illuminating Company is having plans drafted for a new power plant on Congress Street. The structure will be one story high, of brick, fifty-five feet by seventy-seven feet, and will cost about $15,000.

LINTON, IND.—M. R. Ellis, representing Chicago capitalists, has bid $23,000 for the municipal electric-light plant. If the deal goes through the plant will be removed to another site, enlarged and installed with new machinery and equipment. S.

PALO ALTO, CAL.—A bond election will be held here on May 10, 1909, to decide on the issuance of bonds to the amount of $7,000 for municipal improvements. A new street-lighting system costing $3,500 is a part of the proposed issue. A.

OROVILLE, CAL.—The Board of Supervisors has sold to the Sierra Power Company a franchise to erect and maintain its distributing lines in Butte County and to engage in the business of supplying electricity for power and lighting purposes throughout the county.

WINNIPEG, MAN.—The Great Falls Power Company, capitalized at $6,000,000, and headed by H. M. Byllesby, of Chicago, proposes to develop 180,000 horsepower in the Winnipeg River and distribute it to sixty-three towns in the province. The canal is to cost $1,000,000. C.

NORRISTOWN, PA.—The Huntingdon Valley Light and Power Company has been chartered. The object is to furnish electric light in Springfield township. The capital stock is $5,000, divided into 100 shares, which are held by William West, of Philadelphia; Henry C. Thayer, Merion; E. E. Mandeville, Devon; M. F. Maury and W. W. Levering, Germantown, and George S. Stewart, Philadelphia.

HARTFORD, CONN.—The North Branford Light, Water and Power Company has been incorporated by J. P. Manning and associates. The company may take water from the Twin Lakes, in North Branford, their tributaries, the Branford River and tributaries and the West River.

GREENPORT, N. Y.—The Patchogue Electric Light Company has certified to the Secretary of State that the amount of its capital stock has been increased from $40,000 to $70,000, divided into shares of $50 each. E. E. Hawkins is president of the company, and H. S. Conklin is secretary.

FALL RIVER, MASS.—Henry C. Anthony, David J. White and John L. Borden have applied for an act of incorporation of the Portsmouth Electric Company, the purpose of which is to produce and sell light, heat and power generated by means of electricity, in the towns of Portsmouth and Middletown.

VICTORIA, B. C.—Active work has begun on the construction of the power plant of the Stave Lake Power Company. Secretary William McNeill returned recently from Montreal, having completed all financial arrangements. He states that within eighteen months the plant will be ready to supply power.

BURLINGTON, N. C.—The builders of the Burgraham electric lines, a company recently chartered, are also the promoters of the $350,000 Southern Power and Traction Company, which has been granted charters by Burlington, Graham, Reidsville, Wentworth and other towns in the middle-north section of the state. L.

NEW YORK, N. Y.—The Seattle Electric Company has sold to Lee, Higginson & Company $1,600,000 Seattle Electric Company, Seattle-Everett first mortgage five-per-cent bonds, dated March 1, 1909. The total authorized issue is $5,000,000, of which the amount issued is the total outstanding. The bonds are offered to net 5.10 per cent.

GILMER COUNTY, GA.—William M. Scott, of Atlanta, and associates, have asked for a charter for the Coosawattee and Mountaintown Rivers Power and Improvement Company, $50,000 capital, to develop extensive power plants on the Coosawattee and Mountaintown rivers, in Gilmer County, and supply towns in the vicinity with electric power. L.

SANTA FE, N. M.—Ernest H. Fish has applied for the right to divert the waters of the Pecos River and Holy Ghost Creek for power purposes. He states that a power plant with a capacity of 5,000 horsepower will be located at the headwaters of Pecos River, with a five-foot pipe line six miles long to carry the water from the diversion ditch to the power site. The estimated expenditure is $500,000. A.

RED BLUFF, CAL.—The Sierra Electric Power Company has filed articles of incorporation. The directors named are Ben F. Woolmer, T. C. Warren and Boyd L. Wilson, of San Francisco, and Frank E. Horton, of Berkeley. The capital stock is $500,000. The work of constructing a power plant will soon begin, and as the franchise has been obtained, the company can begin work at any time on the power lines.

PHŒNIX, ARIZ.—The power plant on Fossil Creek, Yavapai County, which is being put in at an investment of probably $2,000,000, will furnish electric illumination and power for a radius of seventy-five or 100 miles around Prescott to towns and mining properties. This plant will be fully completed this year and is already furnishing a large supply of current. Its final capacity will be from 8,000 to 10,000 horsepower.

DENVER, COLO.—Work has begun on the construction of a substation half a mile west of the city limits where the electric current furnished to the Denver Gas and Electric Company by the Central Colorado Power Company from its plant at Shoshone, near Glenwood Springs, will be stepped down and made available for use in lighting purposes in Denver. The new transformer station is to cost $50,000. It will be ready about June 1. Charles J. Sheely has the contract.

BRAZIL, IND.—A syndicate of Indianapolis capitalists, headed by F. M. Fauvre, has purchased the property and contracts of the Brazil Electric Company, which has the contract for furnishing the lights for the streets of Brazil. The largest portion of the stock was owned formerly by P. D. C. Ball of St. Louis, Mo. All of Mr. Ball's interests were purchased and most of that held by Brazil citizens. The plant will be enlarged and will become a part of the big power scheme of Fauvre, between Terre Haute and Indianapolis.

TOLEDO, OHIO—The Defiance Gas and Electric Company, of Defiance, Ohio, was incorporated April 20 with a capital stock of $200,000, to take over the plant of the Defiance Gas and Electric Company, which was recently bought by Henry W. Persons and others acting in the interest of the bondholders. The incorporators of the new company are Henry W. Persons, T. S. Atkinson, Wm. T. Morris, Walter Gleason and C. E. Chenevert. Should the City Council grant the new owners of the plant a new franchise and lighting contract, it is said that $50,000 will be spent in rebuilding the plant. The new owners represent the Consolidated Gas and Electric Company, of Ithaca, N. Y., who control the stock of the company. H.

ELECTRIC RAILWAYS.

(Special Correspondence.)

GUTHRIE, OKLA.—The Clinton Street Railway Company has been organized with a capital of $50,000.

CHICAGO, ILL.—The La Salle Street tunnel, used by the Chicago Railways Company, will be reconstructed immediately.

SACRAMENTO, CAL.—The Central California Traction Company has obtained a franchise to run cars on certain streets in this city.

SPRINGFIELD, ILL.—A license to incorporate has been issued to the Danville, Crescent & Kankakee Traction Company; capital $10,000.

DES MOINES, IOWA—Negotiations are in progress for the sale of the Crooked Creek Railway to the Fort Dodge, Des Moines & Southern Interurban Company. C.

CHEHALIS, WASH.—The City Council has granted a franchise to the Twin City Light and Power Company for an electric railway between Centralia and this city. A.

SAN RAFAEL, CAL.—E. B. Martinelli has asked for a franchise to construct an electric road from Manzanita station to Coyote Canyon, a distance of about three miles. A.

VOLLMER, IDAHO—Active work has commenced on the construction of the Nez Perce & Idaho Electric Railway. A construction camp has been opened near this city. A.

TACOMA, WASH.—The Tacoma Railway and Power Company is preparing to build a car barn, 175 by 400 feet, this summer. This barn will accommodate about sixty cars. A.

NASHVILLE, TENN.—The Nashville & Crocker Springs Rapid Transit Company has been incorporated to construct a line between this city and the Crocker Springs property; capital $50,000.

FRESNO, CAL.—Vice-president and General Manager F. S. Granger, of the Fresno-Hanford & Summit Lake Interurban Railway Company, has applied for a fifty-year franchise over rights-of-way in this county. A.

HUNTINGTON, IND.—The Fort Wayne & Wabash Valley Traction Company is installing sidings to a number of industrial plants on its line and will secure a large amount of freight and express business by such policy. S.

WACO, TEX.—The cities of Waco and Temple have decided to put up a $50,000 bonus for a company to build an electric railway between the two cities. In the event of the offer not being taken up promptly the two cities will organize a company to build the line.

NEWPORT, ARK.—J. A. Picroll and associates, of Louisville, Ky., are making arrangements to build an interurban line from Corning to Maynard. Maynard is reported to be ready to grant a right-of-way for a considerable distance and to give a $10,000 bonus.

ELIZABETH, N. J.—A fourteen-mile trolley line is planned to connect Elizabeth and Perth Amboy, which would complete the electric railway connections between many New Jersey towns. Former Senator Pettigrew heads the syndicate which proposes to build the new line.

OKLAHOMA CITY, OKLA.—Members of the Chamber of Commerce have subscribed $50,000 bonus money for the construction of an interurban line from this city to El Reno by J. W. Maney and Henry Schaefer. The line will be twenty-nine miles long and will cost $722,000.

EVANSVILLE, IND.—At a meeting of the directors and officials of the Evansville & Southern Indiana Traction Company, held in this city April 21, it was decided to expend $60,000 in improvements on its roadbed and power plant this summer. Fletcher Durbin is general manager. S.

CHARLOTTE, N. C.—David Barry of Amherst, Mass., and James W. Barry, of this state, have been granted a franchise to build an electric trolley system in Concord and Cabarrus County. Work on the system, which will cost between $100,000 and $150,000, will be commenced in June.

BELLINGHAM, WASH.—The Whatcom Railway and Light Company, of this city, proposes to spend over $200,000 in improvements this year. The first work begun will be the extension of the line along North Street and the construction of the Dock Street line, which will cost about $26,000. A.

TOLEDO, OHIO—Beginning on April 25 the Ohio Electric, known among local interurbans as the Scenic Route, is running a limited service between Toledo, Lima and Springfield. At the start but six cars are being operated between Toledo and Lima, and the time is two hours and fifteen minutes, practically the same as that of the C. H. & D. The distance is seventy-two miles. The Ohio Electric has connections which now make it possible to make the run from Cleveland to Columbus in five-and-one-half hours, which is said to be the fastest long-distance trolley service in the world. At the same time, with the inauguration of the new limited service, the new Toledo passenger and freight terminals at Avondale and Belmont avenues were opened. H.

ELIZABETH, N. J.—The Traction Development Corporation of New Jersey has been organized to construct trolley lines for nearly fourteen miles, with branches in Elizabeth, Elizabethport, Linden, Tremley, Rahway and Carteret, the new town of Roosevelt, Canda, Chrome, Woodbridge and Perth Amboy.

YORK, PA.—Extensions costing $100,000 to the trolley system in this city will be made by the York Railways Company. Several lines will be double-tracked and routes laid out to eliminate congestion. These improvements will be made as soon as the ordinance is finally signed by the mayor.

SACRAMENTO, CAL.—The Northern Electric Company is planning to extend its lines south through the San Joaquin Valley. Manager Chapman De Wolfe, of the securities department, has announced that he will be in Visalia soon to discuss the matter of extension with the Chamber of Commerce of that city. A.

TRENTON, N. J.—The Lakewood & Seashore Railway Company has been incorporated with a capital stock of $300,000, to take over the business of the Trenton, Lakewood & Atlantic Railway Company, which was formed two or three years ago for the purpose of constructing a trolley line from Trenton to Lakewood.

NAPA, CAL.—At the annual meeting of the stockholders of the Vallejo, Benecia & Napa Valley Railroad Company, it was decided to reduce the number of directors from seven to three. The following were chosen as officers and directors: President, W. T. Botsford; vice-president, Dr. E. Z. Hennessey; secretary, John T. York. A.

VINCENNES, IND.—A syndicate composed of Louisville men who command large means has purchased the Vincennes Street and Interurban Railway property and will at once extend the line from Vincennes to Sullivan. This move forestalls the plans of the McGowan syndicate to construct a line between the two cities named. S.

INDIANAPOLIS, IND.—Representatives of seven interurban roads appeared before the Indiana Tax Board last week and all but three asked for a reduction in the valuation of their property. Financial depression, depreciation of roadbed and equipment, and the infancy of the interurban business were assigned as causes why a reduction should be made. S.

BERKELEY, CAL.—The electrification of the Southern Pacific Railway Company's Berkeley (Cal.) lines has been recently commenced, Edward G. Miller being in charge of the work. It is estimated that the construction of the four lines which are to be built will involve the sum of $3,000,000. Power will be supplied from the central power station at Fruitvale. A.

DECATUR, IND.—The trouble over the Winchester street crossing between the Ft. Wayne & Springfield interurban road and the Chicago & Erie steam road has reached the injunction stage. The steam line is seeking to compel the interurban line to put in an interlocking system at the crossing over its tracks and the court will have to decide the matter. S.

INDIANAPOLIS, IND.—Arrangements have been made by a number of traction lines out of this city with steam lines for the exchange of passenger business at junction points and tickets are sold for passage over the entire route. Traction companies sell tickets to St. Louis, Chicago, Bedford, Cincinnati and some eastern points for passage over interurban lines and connecting steam lines. S.

WARSAW, IND.—The City Council has granted a franchise to the Wabash & Northern Traction Company, which proposes to construct a line from Wabash to this city. The company was represented by J. A. Barry, who said work on the grade would begin at once. J. H. Todd, of Indianapolis, representing the Terre Haute, Indianapolis & Eastern Traction Company, is likewise seeking a franchise and right-of-way for a line from Wabash to Warsaw. S.

POTTSVILLE, PA.—A petition has been presented by the Board of City Trusts of Philadelphia to eject the Schuylkill Traction Company from the lands of the Girard estate. The application, if granted, would force the traction company out of business, as the trolley tracks run for miles over the Girard lands. The lawsuit arose over a question of a renewal at higher rates of the lease of the estate's surface territory to the traction company.

SPRINGFIELD, OHIO—Traction men all over the country are watching with interest the efforts of a number of persons to secure the Springfield & Xenia Traction line, now owned by Cleveland people. John B. Linn, brother-in-law to E. S. Kelly, the millionaire manufacturer and owner of the Arcade, is after the road, as are also the Dayton, Xenia & Springfield and the Cincinnati Terminal companies. Should Linn secure the road, it is claimed that he will form a company, purchase the road and Neff Park at Yellow Springs and operate both together. H.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

BROCKET, N. D.—The Brocket Farmers' Telephone Company will extend its lines. W.

SPIRIT LAKE, IOWA—The Midland Telephone Company will build an exchange here. W.

CLINTON, IOWA—The plant of the Tri-City Telephone Company was damaged $10,000 by fire. C.

OMEMEE, N. D.—The Farmers' Mutual will build a telephone line out of this city to Landa. W.

JACKSONVILLE, FLA.—A franchise has been granted to the East Florida Telephone Company.

DYERSVILLE, IOWA—The Luxenburg & Millville Telephone Company will establish an exchange here. W.

BIRD ISLAND, MINN.—The Bird Island Telephone Company will soon begin construction work on rural lines. W.

PIERRE, S. D.—The Esmond-Iroquois Telephone Company has been incorporated with a capital stock of $4,400. W.

LAUREL, NEB.—The Laurel Mutual Telephone Company has been incorporated with a capital stock of $16,000. W.

MASON CITY, IA.—The Portland Heights Telephone Company has been incorporated with a capital stock of $10,000. W.

OKOBOJO, S. D.—W. E. Jenkins and others have organized a telephone company to construct a line from this point to Onida. W.

MILES CITY, MONT.—The Rocky Mountain Bell Telephone Company has appropriated $8,000 for the removal of its poles from the streets. C.

SEYMOUR, IND.—A receiver has been appointed for the Seymour Home Telephone Company. The Citizens' company will likely buy the property. S.

ALTOONA, IOWA—A franchise has been granted to the Rural & Four City Independent Telephone Company to erect and maintain a telephone exchange. C.

BENTONVILLE, VA.—The Warren County Farmers' Telephone Company is chartered by R. A. Tristoe, secretary, and others, of Bentonville, the capital being $5,000. L.

DAYTON, OHIO—Five new branch telephone exchanges will shortly be erected in the city by the Home Telephone Company. About $200,000 will be expended on the extension of cable facilities throughout the summer.

INDIANAPOLIS, IND.—The Board of Public Works has issued a permit to the Indianapolis Telephone Company to lay conduits to and through the Irvington district and to construct and equip an $80,000 exchange building. S.

SHELBYVILLE, IND.—The Western Union Telegraph Company is installing telephones in each of the twenty-eight blocks on the Big Four Railroad between Indianapolis and Cincinnati. The work will be completed in six weeks. S.

GRUNDY, VA.—The State Telephone Company, $1,500 capital, has been organized here with E. E. Smith, secretary and treasurer, of Grundy. The company proposes to construct a line to Blackey, about fifteen miles distant. L.

COUNCIL BLUFFS, IOWA—The transfer of the property of the Mills County Telephone Company to the Independent company of this city has been effected. The new owners intend to spend from $25,000 to $30,000 on improvements.

LAGRANGE, IND.—The Farmers' Mutual Telephone Company has incorporated to build an exchange at Brushy Prairie and extend the lines throughout Lagrange County. Arthur K. Hammond, E. W. Ernsberger and Fred Seaburn, directors. S.

CLEVELAND, OHIO—The Cuyahoga Telephone Company has sold notes aggregating $475,000 and will proceed at once with the erection of a Wade exchange on East Eighty-first Street. It will have a capacity for 7,000 telephones.

BRAZIL, IND.—The Citizens' Telephone Company is reported to have absorbed and taken over the property of the Central Union Telephone Company in this place. The latter company has 350 telephones in operation and will retain only a toll-line station. S.

ALBANY, N. Y.—Stockholders of the Hudson River Telephone Company have approved a plan for the sale of their company to the Central New York Telephone Company. The present Hudson River minority stockholders will receive $66 per share from the Central New York company.

TOLEDO, OHIO—An echo of the big sleet storm of last February was the appointment of Judge J. C. Royer, of Tiffin, receiver for the Home Telephone Company, of that city, which was done April 21. The action was precipitated when the Cleveland Trust Company, of Cleveland, filed a suit to foreclose on $99,000 first mortgage bonds. The company's affairs were badly mixed up and crippled by the big sleet storm which practically put the company out of business for a few days and necessitated many expensive repairs. H.

TRENTON, N. J.—The Mutual District Telegraph and Messenger Company, with capital of $100,000 and head offices at Elizabeth, N. J., has been incorporated. The incorporators are: Joseph A. McClary, George W. Blanchard and Henry W. Pope. The company is to operate telegraph and telephone lines, etc.

FT. WAYNE, IND.—An interesting meeting was held in this city April 23 by the members of the Indiana Independent Telephone Association of the Second District, comprising several northeast Indiana counties. The principal object of the meeting was to select delegates to the annual meeting of the state association at Indianapolis next month. The following officers were elected: President, Wm. L. Moueller; secretary-treasurer, Martin Umbach. S.

ELECTRICAL SECURITIES.

The bull campaign made further progress last week and prices made a general advance, including some significant rallies in leading specialties. Although trade was largely professional many commission houses reported a good deal of public indifference. The attention which outside speculators are giving to the market leads to the belief that there will be a continuance of good buying from now on. The investment attitude is also looking up and in fact on one day there was the unusual heavy total of $10,000,000 in bond ventures. A steel corporation reports net clearings of something like $22,000,000 for the March quarter. Business, it is stated, has been largely stimulated by the lower prices and it is understood that there is enough work in hand to insure a comparatively busy season.

Dividends have been declared upon the following electrical securities: Connecticut Railway and Lighting Company; the regular quarterly dividends of one per cent on the common and one per cent on the preferred stock, payable May 15; books closed April 30 and will reopen May 17. American District Telegraph Company of New York; the regular semi-annual dividend of one per cent payable May 15 to stock of record May 1. National Carbon Company; the regular quarterly dividend of one-and-three-fourths per cent on the preferred stock, payable May 15; books close May 4. Helena Light and Railway Company; the regular quarterly dividend of one-and-one-fourth per cent on the preferred stock, payable May 1 to stock of record April 26.

ELECTRICAL SECURITIES FOR THE WEEK ENDED APRIL 24.

New York:	*Closing.*
Allis-Chalmers common	15⅞
Allis-Chalmers preferred	49⅞
American Tel. & Tel. Company	141¼
Brooklyn Rapid Transit	78⅞
General Electric	158
Interborough-Metropolitan common	15⅝
Interborough-Metropolitan preferred	45
Kings County Electric	123
Mackay Companies (Postal Telegraph and Cables) common	78¼
Mackay Companies (Postal Telegraph and Cables) preferred	73
Manhattan Elevated	144
Metropolitan Street Railway	26
New York and New Jersey Telephone	114
Western Union	69
Westinghouse Manufacturing Company	81½

Directors of the Brooklyn Rapid Transit Company are scheduled to meet in a few days for the second declaration of a dividend on the stock.

General Electric sales are showing a steady betterment, and gross business at present is at the rate of $7,000,000 or $8,000,000 per annum better than two months ago, an improvement of over seventeen per cent. New orders are now coming in at the rate of $52,000,000 per annum, against about $44,000,000 in February. The improvement is general in all departments.

Boston:	*Closing.*
Edison Electric Illuminating	——
Massachusetts Electric	71¾
New England Telephone	131¼
Western Telephone and Telegraph pref.	82
Philadelphia:	*Closing.*
Electric Company of America	12
Electric Storage Battery common	45¾
Electric Storage Battery preferred	45¾
Philadelphia Electric	11⅞
Philadelphia Rapid Transit	31¼
United Gas Improvement	88

The common stock of the Electric Storage Battery Company has been placed on the regular list of the Philadelphia Stock Exchange.

Chicago:	*Closing.*
Chicago Telephone	133
Commonwealth Edison	114
Metropolitan Elevated preferred	50
National Carbon common	82
National Carbon preferred	118¾

PERSONAL MENTION.

LOUIS A. FERGUSON, vice-president of the Commonwealth Edison Company, returned from his southern trip this week.

SAMUEL INSULL, president of the Commonwealth Edison Company, returned this week after an extended trip abroad.

FRANK F. FOWLE, consulting engineer, has moved his office from room 736 Marquette Building, Chicago, to room 937 of the same building, where he will be better able to look after his constantly increasing clientele.

W. A. LAYMAN, manager of the Wagner Electric Manufacturing Company, St. Louis, Mo., has been elected a councilor of the National Metal Trades Association, which held its convention recently in New York city.

A. P. LATHROP, formerly of Columbus, was made president of the American Light and Traction Company at its annual meeting, to succeed Emerson McMillin, who resigned. Mr. Lathrop has been vice-president and treasurer.

L. D. HITZEROTH, of San Francisco, Cal., has resigned as electrical engineer of the Century Electric Construction Company to become superintendent of the power houses for the Nevada-California Power Company, at Bishop, Cal.

HENRY I. LEA, of The Rookery, Chicago, the well-known gas engineer and expert, is the author of "A New Method of Gas Manufacture," a paper read before the Illinois Gas Association, Chicago, March 17, 1909. This has been reprinted in pamphlet form.

JOHN F. GILCHRIST, assistant to the president of the Commonwealth Edison Company, has been elected secretary of the Industrial Club of Chicago, an organization of influential business men which deals with the larger topics of political and commercial advancement, as improvement of jury service and the consular representation of the United States.

A. M. ROBERTSON has been elected second vice-president of the Minneapolis Street Railway and St. Paul City Railway companies. He will continue to act as assistant to the president of Twin City Rapid Transit Company, a position he has held for some years, and the title is conferred by the directors to give him identity, his duties remaining about the same.

CHARLES J. RUSSELL will represent the Philadelphia Electric Company at the Seventh International Congress of Applied Electricity. Mr. Russell is a member of the congress and a district manager of the company. The congress will be held in London, May 25 to June 2, and after the adjournment Mr. Russell will visit various plants in England, France, Germany and Switzerland, investigating the various industrial applications of electricity, with especial regard to electro-chemical and electro-metallurgical processes.

PUTNAM A. BATES, consulting electrical engineer, is removing his office to the new United States Express Building, 2 Rector Street, New York city, where on the top floor facing south and southeast he will have quarters three times larger than the old offices on Broadway. Mr. Bates has not only kept his staff together during the period of depression, but has enlarged it and has increased the number of departments of work covered. He finds the outlook excellent and has now several important commissions on hand.

PROF. ROBERT B. OWENS, for the past eleven years professor of electrical engineering at McGill University, Montreal, has resigned to take up private engineering practice in the United States. Dr. Owens retires as the head of one of the best-known electrical engineering schools on the continent, which his efforts and ability developed to its present state of efficiency. It is understood that Dr. Owens' retirement is due to ill health, and it is hoped that his projected sojourn in the South, before taking up active practice, will entirely restore him to his usual rugged condition.

OBITUARY.

LEONARD COX, sixty-eight years old, a resident of Brooklyn, for twenty-two years traveling auditor for the Western Union Telegraph Company, died on April 19 in the German Hospital in San Francisco, of heart failure. He was in the battle of Bull Run in the Confederate Hospital Corps and was present also at the siege of Richmond. Later as a telegraph operator he was at the siege of Charleston. He left two daughters.

HENRY D. MACDONA died on April 25 at his home in Scarsdale, N. Y., at the age of fifty-five. Mr. Macdona was once active in the affairs of the Metropolitan Street Railway, but shortly after William C. Whitney's death severed relations with the company. He was a treasurer and a director of the Inter-State Tunnel Railway Company of New York. Mr. Macdona was graduated from Manhattan College and the Columbia University Law School. After his graduation he entered newspaper work and for several years was on the staff of the New York Herald. He was at times correspondent at Albany, Washington, Mexico and Europe, and accompanied the expedition which went into the arctic regions in seach of the lost Jeannette. On his return from the Jeannette expedition he began the practice of law in the office of Morgan J. O'Brien, who had been his classmate in college. In 1887 Mr. Macdona was appointed a deputy assistant under District Attorney Fellows. When District Attorney Nicoll succeeded Col. Fellows Mr. Macdona was made Chief Deputy Assistant. In 1892 he was appointed Assistant District Attorney by Mr. Nicoll. Afterward he resigned and again took up newspaper work, later resuming the practice of law. He was buried at White Plains, N. Y.

MAJOR LEWIS FREDERICK RICE, who since 1890 had been assistant engineer and architect for the American Bell Telephone Company, died at his home at Brookline, Mass., April 13. Major Rice was seventy years of age. He was a graduate of the Rensselaer Polytechnic Institute and served on the Brookline water works as construction engineer, and later on the Troy & Greenfield road. He served in the Civil War and then became assistant engineer for the Reading & Columbia Railroad and later engineer of the St. Louis water works.

NEW MANUFACTURING COMPANIES.

SAN DIEGO, CAL.—The Johnstone Electrical Company has been incorporated with a capital of $20,000 to do electrical contracting as well as manufacture and deal in electrical appliances. It has a capital stock of $20,000. The incorporators are A. E. Johnstone, J. S. Johnstone, W. G. Hutchinson, J. L. Edwards and G. E. Kirkpatrick.

OKLAHOMA CITY, OKLA.—The Oklahoma Battery Company has been organized here, with a capital of $100,000, to make a specialty of furnishing electric lights and power without the aid of the dynamo, for suburban homes, farm and car lighting and where electric light cannot be obtained from power stations. The company will be equipped also to furnish power for telephone exchanges, telegraph offices, electric automobiles, electric boats, and the like, at a cost, it is said, of less than one-tenth of the preent cost of batteries now in use. The incorporators are C. G. Frost, Oklahoma City, president; H. A. Miles, Oklahoma City, secretary; A. Gordon, Mangum, vice-president; R. H. Drennan, Oklahoma City, vice-president; A. McBride, director. The above officers are also directors and represent over half a million of capital.

NEW PUBLICATIONS.

TECHNICAL BOOKS OF 1908—This is the title of a classified and descriptive index of the chief technical books published in 1908 and acquired by the Pratt Institute Free Library, Brooklyn, N. Y. It should prove of interest to New York engineers and students.

REPORT OF THE COMMISSIONER OF EDUCATION—The United States Bureau of Education has published the annual report of its commissioner for the scholastic year 1907-08. Vol. I consists of 382 pages devoted to a general survey of educational progress throughout the world and particularly in this country. Vol. II, containing school statistics, is not yet completed. Considerable attention is devoted to the movement for industrial education. A very complete list of foreign universities and of domestic executive school officers and college presidents is also given.

BULLETIN OF THE INTERNATIONAL BUREAU OF THE AMERICAN REPUBLICS—The April number of the monthly Bulletin of the International Bureau of the American Republics contains in its entire make-up marked evidences of the extensive work taken up by this bureau in disseminating useful and authentic knowledge of the American republics mutually among them. The bulletin has recently been much enlarged and is now copiously and well illustrated. Among the many interesting articles in this number are an extended report of the First Pan-American Scientific Congress held in Santiago, Chile, December 25, 1908, to January 5, 1909, and an article by Russell H. Millward on "Wireless Telegraphy in the American Republics." Accompanying this is a map of the Americas, showing the location of wireless stations.

PUBLIC SERVICE COMMISSION, NEW YORK—The Public Service Commission of the Second District of the State of New York has published in full its opinion in the matter of the application of the Buffalo, Rochester & Eastern Railroad Company for a certificate of public convenience and a necessity under Section 59 of the Railroad Law, and permission to commence construction and exercise franchises under Section 53 of the Public Service Commission Law. The Public Service Commission for the First District has published preliminary abstracts of reports for the half year ended December 31, 1907, of the New York Edison Company and the United Electric Light and Power Company for the year ended June 30, 1908, and the Coney Island & Brooklyn Railroad Company, the Marine Railway Company and the Van Brunt Street & Erie Basin Railroad Company, and a summary of quarterly reports of railroad and street railways operating in the city of New York for October, November and December, 1908. A report upon types of electric meters in use in New York city, by Cary T. Hutchinson, special consulting engineer, has also been distributed.

NEW PROPOSALS.

HOLLISTER, CAL.—Bids will be received by the Board of Supervisors of Hollister, Cal., until May 17, 1909, for a power franchise in this city.

TEXARKANA, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., May 31, 1909, for the construction complete (except elevator) of the United States Court House at Texarkana, Texas.

ENGINE AND GENERATOR, RUSHVILLE, IND.—The city clerk of Rushville, Ind., is asking for bids until May 14 for the furnishing of an engine, piping, alternating-current generator and exciter and installing the same in the municipal electric-light plant. A. T. Mahin, superintendent. S.

VERMILLION, S. D.—E. C. Erickson, president, care of Secretary C. A. Sloan, will receive bids up to 1:30 p. m., May 6, for the electric wiring of the proposed addition to the mechanical building of the Northern Normal and Industrial School at Aberdeen, S. D. Check for five per cent must accompany bids. C.

SAN ANGELO, TEX.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 o'clock p. m., May 29, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring, and standard clock system) of the United States Post Office and Court House at San Angelo, Texas.

POST OFFICE, YAZOO CITY, MISS.—The office of the Supervising Architect, Washington, D. C., will receive sealed proposals until 3 p. m., May 10, 1909, for the construction complete of the United States Post Office, at Yazoo City, Miss., in accordance with the drawings and specifications, copies of which may be had at the office of the Postmaster at Yazoo City, Miss., or of the Supervising Architect.

ENGINEERING SOCIETY NOTE.

ELECTRICAL CLUB OF CALIFORNIA—The Electrical Club of California has been organized in San Francisco, its object being to advance the social as well as commercial interests of its members. Over 150 members have been enrolled, including the representative electrical men in that section. Luncheon is held every Thursday at the Argonaut Hotel. At each meeting a paper is read, and the club finds that it is doing good work among the electrical people. The officers are Henry F. Frosch, president; Arthur E. Rowe, vice-president, and Russell D. Holabird, secretary. This club is modeled on the plan of the Chicago Electric Club, which now has over 400 members enrolled.

DATES AHEAD.

American Electrochemical Society. Next meeting, Niagara Falls, Ontario, May 6-8.

Omaha Electrical Show. Omaha Auditorium, Omaha, Neb., May 6-15.

Nebraska Electrical Association. Annual convention, Omaha, Neb., May 11-13.

Arkansas Association of Public Utility Operators. Annual meeting, Hot Springs, Ark., May 12, 13, 14.

Southwestern Electrical and Gas Association. Annual convention, Dallas, Tex., May 20-22.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual convention, Canton, Ohio, May 21-22.

American Association of Electric Motor Manufacturers. Annual convention, Hot Springs, Va., May 24-27.

West Virginia Independent Telephone Association. Annual convention, Parkersburg, W. Va., May 27-28.

National Electric Light Association. Annual convention, Atlantic City, N. J., June 1-4.

Association of Edison Purchasing Agents. Annual convention, Atlantic City, N. J., June 1-4.

American Railway Master Mechanics' Association. Annual convention, Atlantic City, N. J., June.

Master Car Builders' Association. Annual convention, Atlantic City, N. J., June.

Canadian Electrical Association. Annual convention, Quebec, Canada, June 16-18.

Association of Railway Telegraph Superintendents. Next meeting, Detroit, Mich., June 23.

American Institute of Electrical Engineers. Annual convention, Thousand Islands, N. Y., June 28.

Ohio Electric Light Association. Annual convention, Toledo, July 13-15.

National Electrical Contractors' Association. Annual convention, Toledo, Ohio, July 21-23.

INDUSTRIAL ITEMS.

THE CONSOLIDATED RAILWAY, ELECTRIC LIGHTING AND EQUIPMENT COMPANY, New York, N. Y., announces that it has no connection of any kind with any other electric car-lighting company.

THE WESTERN ELECTRIC COMPANY, 463 West Street, New York, N. Y., is distributing a very effective folder devoted to the "Blue Bell" battery for telephone service. This battery holds up its capacity over an extremely long life.

THE INTERNATIONAL ELECTRIC METER COMPANY, Chicago, has moved into new quarters at 110-112 North Sheldon Street. The company has greatly increased its facilities to take care of its expanding business. The conditions of manufacturing are of the best, all departments being exceptionally clean and well lighted. The company is in a position to take care of its customers better than ever before.

THE BELDEN MANUFACTURING COMPANY, Chicago, Ill., has been appointed special agent for the Hope Webbing Company, of Providence, R. I. The company will have complete charge of the sales of electrical tapes, webbings and sleevings for the Hope Webbing Company in Illinois, Wisconsin, Iowa, Minnesota, South Dakota, North Dakota and Montana, and will carry a large stock of these goods in its Chicago warehouse, from which immediate deliveries to the western trade can be made.

THE CRESCENT COMPANY, 103 West Adams Street, Chicago, announces that it has taken the agency for the Dickinson Manufacturing Company, of Springfield, Mass., manufacturer of a specialty of molded insulation. This company has been making composition and mica waterproof sockets, socket bushings, socket rings, telephone receivers, receiver shelves, mouthpieces, switch handles and socket keys. An entirely new composition known as "Gummon," with high insulating qualities, has also been developed.

THE WESTON ELECTRICAL INSTRUMENT COMPANY, Waverly Park, Newark, N. J., has hit upon a unique advertising scheme. The company sends out regularly a data sheet from the Western Correspondence School. The tuition is "free," and the course is one in "Economics." The first lesson is on the subject "First Cost Not Whole Cost." Those interested in securing information concerning electrical measuring instruments should become students in this course. In addition to the headquarters, local associate instructors are established in all the large cities in the country.

THE STAVE ELECTRICAL COMPANY, New York, N. Y., has recently received an order for approximately 100 "Stave" flaming arc lamps from the Weston Mott Automobile Company, Flint, Mich. These lamps are being used throughout the different departments of the factory. The Buick Motor Car Company, Flint, Mich., has also placed a large order for "Stave" flaming arc lamps. The clear orange color and even distribution of the light have increased the efficiency of the workmen, and several other automobile concerns are now considering the installation of these lamps.

THE OHIO BRASS COMPANY, Mansfield, Ohio, in its April bulletin describes and illustrates the transmission lines of the Oregon Electric Railway system. There is in addition to this a very interesting article entitled "Some Remarkable Trolley Trips." This is a description of a trolley trip made by a party under the direction of A. A. Anderson from Louisville to Cleveland and return, a total of 1,000 miles, at an average speed of better than thirty miles an hour. During this trip the party, which was composed of members of the Central Railway Association, made a visit to the plant of the Ohio Brass Company.

THE ELECTRIC GOODS MANUFACTURING COMPANY, Boston, Mass., has placed on the market the "Perfex" igniter. This company has taken over the patent rights of the Boston Ignitor Company and has secured the services of the inventor of the system. This igniter eliminates secondary current leakage, as instead of the usual secondary wiring from coil to spark plug the high-tension current has to travel only one-and-one-fourth inches from the base of the igniter to the spark-plug gap, at which point it produces a jump spark of great intensity. No part of the apparatus is affected by rain or spray, and it is stated, moreover, that even a copious stream of water will not cause a misfire.

THE PETTINGELL-ANDREWS COMPANY, Boston, Mass., has issued a handsome catalogue devoted to its fan motors. These include Lundell direct-current, universal joint, desk and bracket fan motors; eight-inch direct-current desk and telephone booth fans; Westinghouse direct-current eight-inch desk and telephone booth fans; Sprague direct-current ceiling fan motors, type T; Shedd oscillating fans; General Electric alternating-current twelve-inch and sixteen-inch swivel and trunnion frame desk and wall-bracket fans; eight-inch desk and telephone booth fans, and General Electric alternating-current ornamental and plain type ceiling fan motors. Copies of this bulletin will be furnished to those interested upon request.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) April 20, 1909.

918,493. MULTIPLE-SWITCH STARTER. Thomas E. Barnum, Milwaukee, Wis., assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Filed May 20, 1907. Renewed January 11, 1909. Combined with a number of resistance switches is a low-voltage magnet for holding the last one closed and adapted to be affected by heat to open the circuit if the resistance is not properly cut out.

918,498. REVOLVING FIELD-MAGNET STRUCTURE. Bernard A. Behrend, Norwood, Ohio, assignor to the Bullock Electric Company. Filed April 9, 1904. Renewed June 8, 1907. An integral rectangular core of high permeability has laminated field poles dove-tailed into it.

918,499. FIELD MAGNET. Bernard A. Behrend, Norwood, Ohio, assignor to the Bullock Electric Manufacturing Company, and Allis-Chalmers Company. Filed May 14, 1904. Renewed July 29, 1907. An amplification of the above provides for a divided winding for each pole piece, side supports for the windings and bolts passing through the poles and between the parts of the windings for retaining the side supports in position.

918,500. SEAL FOR ARC-LIGHT ELECTRODES. Edward R. Berry, Lynn, Mass., assignor to General Electric Company. Filed September 28, 1908. A plug for a magnetite electrode in which the electrode material is compacted in an iron tube consists of a mass compounded of the electrode material and shellacked.

918,501. CONDUCTOR. George W. Bolton Jr., Detroit, Mich. Filed October 15, 1907. A conductor tip comprises a tubular shank section and an open centered body aligning with this shank and having a trough-shaped depression formed transversely therein.

918,513. PANEL CONSTRUCTION FOR SWITCHBOARDS. Amos F. Dixon, New York, N. Y., assignor to Western Electric Company, Chicago, Ill. Filed April 25, 1908. A selector-switch terminal board has shallow grooves in its face, narrow strips of sheet metal imbedded edgewise therein, each strip having projecting ears at intervals along its length adapted to be engaged by the trunk contact brushes of different selectors. Insulating material is flowed over the board and into the grooves and hardened.

918,531. METHOD OF TREATING MILK. James L. Goucher, New York, N. Y., assignor to Goucher Electric Purifying Company, New York, N. Y. Filed January 17, 1907. Consists in establishing in a closed chamber out of contact with outside air a flow of a stream of milk, partially interrupting the flow at a number of points and passing lengthwise through the stream at each point an alternating current having a pressure not less than 1,000 volts, and thereby effecting successive reductions in the number of colonies of bacteria in the milk.

918,532. AUTOMATIC CIGAR CUTTER AND LIGHTER. Patrick H. Greear and John Mackenzie, Minneapolis, Minn., assignors to Lewis V. Peek, Minneapolis, Minn. Filed June 26, 1908. Has an air-suction device for drawing air through the cigar while in position for cutting, an electric motor for actuating the cutter and the suction device, and a clip to close the motor circuit and to move the lighter against the end of the cigar.

918,533. SOCKET SUPPORT FOR ELECTRIC SAD-IRONS. Matthew Griswold Jr., Erie, Pa., assignor to General Electric Company. Filed May 6, 1908. An electric connection socket is adapted to engage the connection studs on the iron and a perforated lug on the socket is adapted to engage a hook on the handle.

918,535. ELECTRIC RESISTANCE UNIT OR ELEMENT. William S. Hadaway, Jr., East Orange, N. J. Original application filed September 26, 1907. Divided and this application filed June 15, 1908. Comprises a conducting ribbon having a number of slots alternately open at opposite edges, the slots being unequally spaced to increase the resistance of portions of the ribbon.

918,537. TRAIN-POSITION INDICATOR. Olaf Halvorsen, Schenectady, N. Y. Filed March 23, 1908. A car-control system comprises means on the car for producing a continous series of electric impulses, automatically varied in correlation with the distance traveled by the car, and means at the dispatcher's office for selectively receiving these impulses.

918,540. RAILWAY-SIGNALING DEVICE. Samuel H. Harrington, New York, N. Y., assignor to William C. Wilson, Nyack, N. Y. Filed March 7, 1905. Provides a pair of overhead signaling conductors that are bridged by the car.

918,547. RESISTANCE UNIT. Harry E. Heath, Lynn, Mass., assignor to General Electric Company. Filed May 7, 1907. A resistance tube consists of similarly shaped strips of asbestos and conducting material spirally wound so as to overlap each other.

918,561. ALTERNATING-CURRENT SHUNT MOTOR. Marius C. A. Latour, Paris, France, assignor to General Electric Company. Filed August 17, 1907. In a single-phase motor of the commutator type there are means of supplying to the exciting winding of the motor shunt and series excitations, both dephased from the armature current.

918,566. TELEPHONE SYSTEM. Ray H. Manson, Elyria, Ohio, assignor to the Dean Electric Company, Elyria, Ohio. Filed April 18, 1907. In a signaling system is a device responsive to the signaling current and means located in one of the conductors of the device and a second electrical path adapted to offer resistance to the current varying inversely as its frequency.

918,574. AIR-CLEANING SYSTEM. William C. Mayo and John Houlehan, El Paso, Tex., assignors of one-third to George E. Briggs, Barstow, Tex. Filed February 24, 1908. Consists of an air pump, an electric motor for driving it, and means responsive to centrifugal action for coupling the motor to the pump.

918,578. ELECTRIC REGULATOR. Morris Moskowitz, New York, N. Y., assignor to United States Light and Heating Company, New York, N. Y. Filed March 14, 1908. Has a pair of nominally opposing magnets provided with auxiliary neutralizing coils, means for energizing one or the other of the coils to neutralize one of the magnets and vertically hung swinging links connected to the magnet cores.

918,590. WIRE-INSULATING MACHINE. Frank D. Platter, Chicago, Ill., assignor to Western Electric Company, Chicago, Ill. Filed June 10, 1905. Consists of a frame, a rotary carrier for a cop of insulating yarn, a magnet adapted when energized to open the clutch connecting the driving mechanism, a hollow contact member through which the wire passes after being covered and a circuit for the magnet terminating on the frame and contact member, the terminals being connected by the bare wire when the supply of yarn is interrupted.

918,594. DYNAMO-ELECTRIC MACHINE. Edward D. Priest, Schenectady, N. Y., assignor to General Electric Company. Filed February 13, 1907. Construction of a direct-current armature core is described in which the laminæ are clamped directly between a shoulder and a nut on the shaft and also held by clamping bolts to permit removal of the shaft.

918,596. MEANS FOR PROTECTING SUBMERGED MOTORS. Henry G. Reist, Schenectady, N. Y., assignor to General Electric Company. Filed February 14, 1907. Is provided with an air-tight enclosing casing for the motor, with an outlet at the bottom and a compressed-air inlet at the top, air being forced into the inlet so as to keep the water in which the casing is submerged practically to the level of the lower outlet.

918,608. MULTIPLE-SWITCH STARTER. Lewis L. Tatum, Norwood, Ohio, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Filed May 20, 1907. Combined with a number of switches is a retaining device for holding them closed, and means for releasing the switches when part of them remain unclosed too long.

918,609. MULTIPLE-SWITCH STARTER. Lewis L. Tatum, Norwood, Ohio, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Filed May 20, 1907. Renewed January 11, 1909. This is a modification of the above.

918,617. ELECTRIC CONNECTOR. John J. Walsh, Yonkers, N. Y., assignor to Yonkers Specialty Company, Yonkers, N. Y. Filed May 1, 1907. Comprises a rigid plate, a spring metal plate co-extensive therewith and held in contact with it at the middle, and conductor terminals clamped between the ends of the plates.

918,618. WIRELESS-TELEGRAPH RECEIVER. Wesley M. Way, Austin, Tex., assignor to George W. Trommlitz, Galveston, Tex. Filed March 7, 1908. Electric circuit terminals are arranged to grasp a crystal between them, one terminal being provided with a cup or holder for the crystal and rotatable about a central longitudinal axis, the other ter-

minal being rotatable about an axis spaced from the axis of the first terminal.

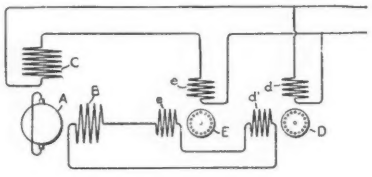
918,623. ELECTROLYTE FOR PRIMARY BATTERIES. James Whitcomb, Corunna, Mich., assignor of one-half to William H. Wilson, Corunna, Mich., and one-half to W. Scott Lockwood, Lansing, Mich. Filed November 27, 1907. Renewed September 29, 1908. Consists of potassium bichromate one-and-one-half ounces, sodium chloride one-and-one-half ounces, acetic acid four drams, acidulated water four ounces, aluminum hydrate four drams, and charcoal four ounces.

918,627. BURGLAR ALARM AND SIGNAL SYSTEM. George M. Willis, Chicago, Ill. Filed December 11, 1906. Provides a normally closed main circuit connecting a central station with the substations to be protected.

918,638. CONTROLLER. Thorsten von Zweigbergk, Preston, England, assignor to General Electric Company. Filed September 14, 1907. Combined with two connection boards are contact fingers carried thereby, a main connecting cylinder, a separate reversing cylinder, and a blow-out magnet, all located in the space between the boards.

918,647. TREATING ANODE SLIME FROM THE ELECTROLYTIC REFINING OF LEAD. Anson G. Betts, Troy, N. Y. Filed January 23, 1907. Consists in dissolving the metal therefrom by treatment with lead peroxide and a solution containing fluorine with an acid forming a readily soluble lead salt, and electrolytically recovering the lead peroxide and the metal of the slime from the resulting solution.

918,649. ACID-PROOF TANK FOR THE ELECTROLYTIC REFINING OF METALS. Anson G. Betts, Troy, N. Y. Filed December 6, 1906. Is made of a cement mixture with solidified sulphur in the pores thereof near the inside surface, and a superposed coating of inert material on the inside.



918,561.—SINGLE-PHASE COMMUTATOR MOTOR.

918,650. ELECTROLYTIC PROCESS. Anson G. Betts, Troy, N. Y. Filed December 23, 1908. Consists of electrolyzing the solution with a cathode which oxidizes with the production of a coating not reduced by the electrolysis, and insoluble in the solution at the cathode.

918,654. LAMP SOCKET. John R. Byrne, Schenectady, N. Y., assignor to General Electric Company. Filed July 5, 1907. Combined with a key is a bearing yoke therefor provided with an aperture at one end, a spring-pressed plunger slidably mounted therein at right angles to the key and a screw-shell contact having a flexible flange adapted to engage the plunger.

918,660. INTERCOMMUNICATING TRUNKING SYSTEM. Elmer R. Corwin, Chicago, Ill., assignor to Corwin Telephone Manufacturing Company, Chicago, Ill. Filed May 9, 1908. A trunk line extending from the intercommunicating system to a magneto exchange has a kick-coil with its secondary bridged across the trunk, and suitable ringing keys at the stations of the intercommunicating system whereby a party may send an impulse through the kick-coil to cause it to throw a drop associated with the trunk line at the exchange.

918,669. METHOD AND APPARATUS FOR TUBULATING LAMP BULBS. John E. Graybill, York, Pa., assignor to General Electric Company. Filed May 17, 1904. Consists in applying a tube to an unpunctured bulb, reducing the pressure in the tube below that in the bulb, whereby a softened portion of the bulb is drawn into the tube, and then welding the tube and bulb together.

918,681. CIRCUIT-BREAKER. Karl Kuhlmann, Berlin-Pankow, Germany, assignor to General Electric Company. Filed August 16, 1907. Combined with tripping means responsive with a time-lag to abnormal current are restraining means adapted to release the tripping means upon the occurrence of excess current beyond a predetermined amount.

918,682. SWITCHBOARD SIGNAL. Oscar M. Leich, Rochester, N. Y., assignor to Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Filed July 29, 1907. Connected with an operator's key is an electromagnet and armature adapted to change an indicator from a displayed to a concealed position.

918,688. CONTROL OF ALTERNATING-CURRENT MOTORS. Howard Maxwell, Schenectady, N. Y., assignor to General Electric Company. Filed February 14, 1906. Combined with a single-phase source of current is an induction motor having a three-phase winding, a resistance and a reactance connected respectively in series with two phases of the motor and means for simultaneously reducing the impedance thereof step by step.

918,690. ALTERNATING-CURRENT MOTOR. Maurice Milch, Schenectady, N. Y., assignor to General Electric Company. Filed December 23, 1903. A repulsion motor having two sets of terminals for forward and reverse rotation is provided with means for connecting and disconnecting one set of terminals and means for short-circuiting the other set through a variable impedance.

918,697. KNIFE-SWITCH HANDLE. Clarence D. Platt, Bridgeport, Conn. Filed December 11, 1908. The grip is fastened to the cross-bar by means of a screw having a wood-screw thread for engaging the grip and a metal-screw thread for engaging the cross-bar.

918,726. SPARK-PLUG. Franz Bartl, Far Rockaway, N. Y. Filed August 12, 1907. Consists of a metallic shell with a contracted portion having an inner coating of refractory insulating material adapted to become malleable by excessive heat and an inner metallic electrode having a similar refractory material on the outside.

918,732. ELECTRIC HEATING DEVICE. Perry C. Chase, Upland, Cal. Filed July 23, 1908. An electric water heater adapted to be submerged has a perforated body and a number of coil-carrying plates arranged in the body in parallel relations.

918,738. SIGHTING APPARATUS FOR GUNS. Arthur T. Dawson and George T. Buckham, Westminster, London, England, assignors to Vickers' Sons & Maxim, Limited, Westminster, England. Filed May 18, 1908. An electrically actuated gun-sighting apparatus adapted to be controlled from a distance is combined with electric transmitting apparatus situated at the control station, electromagnets situated near the sighting apparatus, a switch controlled by the magnets and a sight-actuating motor controlled by the switch.

918,747. ELECTRICALLY-OPERATED STOVE. Harry Hertzberg and Maurice J. Wohl, New York, N. Y., assignors to Economy Electric Company, Brooklyn, N. Y. Filed August 1, 1907. There are co-operating members, one adapted to have a rotary adjustment with respect to the other, an interposed electrical resistance, and means adapted to move the members into clamping engagement with the resistance.

918,748. ELECTRICALLY-HEATED TOOL. Harry Hertzberg and Maurice J. Wohl, New York, N. Y., assignors to Economy Electric Company, Brooklyn, N. Y. Filed November 14, 1907. An electric flatiron has a resistance, a clamping member therefor, and a single wedge co-operating with the clamping member.

918,761. TROLLEY-WIRE SUSPENDER. Joseph Mayer, Rutherford, N. J. Filed December 21, 1907. A hanger for trolley wires comprises a flexible bar and numerous clips for connecting the wire and bar along the whole length of the bar, whose cross-section decreases from the center toward each end.

918,810. SPRING AND EQUALIZER SYSTEM FOR ELECTRIC LOCOMOTIVES. William E. Woodard, Schenectady, N. Y., assignor to American Locomotive Company, New York, N. Y. Filed September 19, 1908. Fitted into the supporting frame are a number of axles and journal boxes, having the capacity of relative vertical and lateral movement, a vertical spring and equalizer system through which the weight carried by the frame is distributed over the several axles and equalizers pivoted on the frame and connected to horizontal springs associated with the journal boxes.

918,813. WRAPPER-CUTTING MECHANISM. Harry Y. Armstrong, Elgin, Ill. Filed May 26, 1908. Comprises an electromagnet for operating the cutting device and a circuit including the magnet provided with two closing contacts arranged for wiping engagement with thin conducting bodies imprinted on the wrapper strip.

918,828. SPRING AND EQUALIZER SYSTEM FOR ELECTRIC LOCOMOTIVES. William Dalton and William E. Woodard, Schenectady, N. Y., assignors to American Locomotive Company, New York, N. Y. Filed September 19, 1908. A modification of No. 918,810.

918,831. SECONDARY BATTERY. Edward C. Ekströmer and Melcher Ekströmer, Boston, Mass., assignors to Joseph C. Kent, trustee, Boston, Mass. Filed May 13, 1907. The active material is mixed with gelatine from which a portion of the nitrogen and hydrogen has been removed, leaving its con-

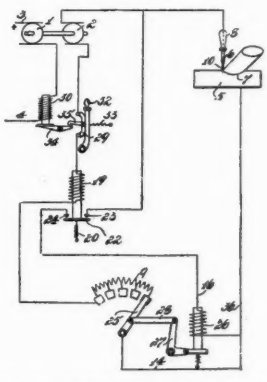
sistency and physical appearance unchanged and rendering it elastic, porous and permissive of dialysis.

918,832. STORAGE BATTERY. Edward C. Ekströmer, Boston, and Melcher Ekströmer, Quincy, Mass., assignors to Joseph C. Kent, trustee, Boston, Mass. Filed August 1, 1907. The inside of the base of the jar is provided with a number of longitudinal ribs having seats for the separators between the plates.

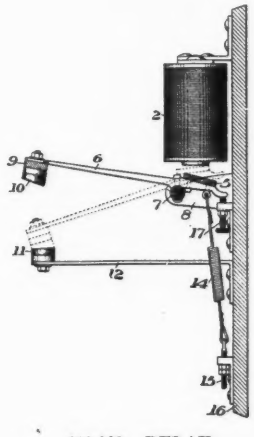
918,844. MEANS FOR CONNECTING CIRCUIT WIRES TO ELECTRIC MOTORS. Adolph L. Goldschmidt, New York, N. Y. Filed August 30, 1906. A conduit extends along the ceiling and hangs down close to the motor, between which and the conduit is a flexible shield protecting the circuit wires.

918,845. SWITCHBOARD. Adolph L. Goldschmidt, New York, N. Y. Filed July 3, 1908. A number of tiers of busbars are arranged in superposed order and connected by separate sets of fuses to a single source of current supply.

918,848. SIGNAL SYSTEM. John L. Hall, Schenectady, N. Y., assignor to General Electric Company. Filed October 11, 1905. The system consists of a receiver, comprising a synchronous motor and signaling devices controlled by its rotor, and a transmitter, having a time mechanism and means controlled thereby for regulating the direction of current in the actuating coils of the motor.



518,921.—WELDING APPARATUS.



919,066.—RELAY.

918,852. TELEPHONY. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio. Filed June 15, 1907. A party-line system includes selective means at the local stations and connected in series in the limbs of the metallic circuit, means for grounding the opposite ends of the circuit, and means for locking the hook switches of all but the connected subscribers.

918,854. LEVER-CONTROLLED SWITCH. Max Hoffmann, Berlin, Germany, assignor to Paul Meyer Aktien-Gesellschaft, Berlin, Germany. Filed February 2, 1907. A laminated switch is bridged over two terminals by means of a lever and cam mechanism.

918,861. ELECTRIC MOTOR. Louis F. Johnson, Chicago, Ill., assignor to P. & O. Electric Company. Filed September 22, 1904. A series motor has a field winding grounded on the field magnet and an armature winding grounded on the armature core.

918,866. ELECTRIC TRANSMISSION OF INTELLIGENCE. Isidor Kitsee, Philadelphia, Pa. Filed June 10, 1908. The line comprises conductively independent conductors disposed in inductive relation with each other and an associated conductor in a cable, there being a number of connections from the associated conductor to ground.

918,884. MOVING-PICTURE MACHINE. Herbert S. Mills, Chicago, Ill. Filed October 3, 1908. Combined with a film-feeding mechanism is an electric motor for driving it and an automatic cut-out for its circuit.

918,891. ELECTRIC CUT-OUT. Thomas E. Murray, New York, N. Y. Filed November 30, 1908. A block of insulation having a transverse opening for a fuse has flanges on two opposite sides of the block below the opening and a vertical web projecting from the remaining sides and extending across and below the bottom thereof.

918,894. FAN BLOWER. Amon T. Noe, Parnassus, Pa., assignor to Electric Renovator Manufacturing Company. Filed September 21, 1907. The fan is entirely enclosed in a casing forming a separate chamber from the motor.

918,905. INSULATOR. Benjamin A. Pond, Boston, Mass. Filed September 5, 1908. An insulating bushing is made of two parts hinged and then cemented and bolted together.

918,921. WELDING APPARATUS. William Siebenmorgen, Westfield, N. J., assignor to C & C Electric Company. Filed February 23, 1907. The circuit comprises a source of current and two terminals, one of which is manually movable, and between which an arc is adapted to be drawn.

918,950. PROCESS OF REDUCING METAL. Henry S. Blackmore, Mount Vernon, N. Y. Original application filed September 24, 1907. Divided and this application filed March 5, 1909. Consists in exposing a substance containing metal and oxygen to electrolysis while employing an electrode containing a metal acetylide decomposed thereby and capable of liberating metal therefrom.

918,955. TELEPHONE SYSTEM. Charles F. Bradburn, Delmer, Ontario, Canada. Filed January 20, 1908. A selecting apparatus consists of a primary dial having a series of contact plates, a pointer revolving on the dial, a detent stop removably connected to the dial to engage the pointer and arrest it at its initial position, and an arresting stop for each contact plate adapted to be set in the path of the pointer.

918,966. LIGHTING ATTACHMENT FOR SHOWCASES. Thomas E. Clark, Detroit, Mich. Filed August 7, 1901. An opaque reflector is fixed in the angle between the top and the transparent wall exterior to the latter and a series of electric lights is mounted in the reflector.

918,969. INSULATING BUSHING FOR ELECTRICAL SERVICE BOXES. Robert C. Cole, West Hartford, Conn., assignor to the Johns-Pratt Company, Hartford, Conn. Filed December 11, 1908. The bushing has a grooved exterior disposed within the aperture and a plastic ring pressed through the larger end of the aperture into interlocking engagement with the grooved exterior, to prevent removal of the bushing.

918,972. IMPLEMENT FOR SLITTING THE ENVELOPE OF TWIN-INSULATED WIRES. William J. Courtney and Thomas F. Courtney, Chicago, Ill. Filed July 31, 1908. The pliers have a supporting plate projecting from one side of one of the parts, a channel-shaped guide secured to the other part and a cutting blade disposed between the guide and a shank on the blade secured to the outer face of the guide.

919,009. ATTACHMENT FOR CURRENT-COLLECTOR WHEELS. Leaddison R. Hecker, Philadelphia, Pa., assignor to Safety Electric Railway Construction Company, Philadelphia, Pa. Filed July 13, 1907. Comprises a threaded plug of insulation, a threaded tube carried thereby, a cap engaging the tube, adjusting means carried by the cap, a transmitting brush within the tube and a cushion between the adjusting means and the brush.

919,010. GALVANIC CELL. William L. Heim, Kane, Pa. Filed February 28, 1908. A dry cell contains a waxy insulating substance, separating its container and the electrolyte, which at normal temperatures hinders the deterioration of the cell, but which may be removed by application of heat to permit the cell to generate current.

919,013. PRESSURE REGULATOR. Henry Hillebrand and Moreton Jack, New York, N. Y. Filed March 18, 1908. Combined with a reservoir, a motor and a pump driven thereby is a regulator having two opposing electromagnets operating on a switch-moving lever.

919,022. CARBON-CONSUMING GALVANIC CELL. Ernst W. Jungner, Kneippbaden, Norrköping, Sweden. Filed June 27, 1906. A primary cell comprises an electrolyte of concentrated sulphuric acid, an anode of amorphous carbon, a cathode of graphite that is oxidizable with difficulty, and means to supply air to the cathode.

919,066. RELAY DEVICE FOR ELECTRIC CIRCUITS. Carl A. Palmgren, Chicago, Ill. Filed April 18, 1907. A vertical magnet has an armature mounted upon the short arm of a lever with a contact button at its further end that engages the corresponding stationary button when the magnet is energized.

919,069. LIGHTNING ARRESTER OR LINE DISCONNECTOR. Jesse W. Pedigo, Chariton, Iowa. Filed June 23, 1908. Mounted on an insulated base is a pair of lower contact members and a pair of upper contact members, a connecting member arranged to slide on the lower ones and to afford connection between them and the upper members.

919,078. MANUFACTURE OF SENSITIVE CELLS. Paul Ribbe, Halensee, near Berlin, Germany, assignor to Fern-Schnell-Schreiber Gesellschaft, Berlin, Germany. Filed January 28, 1909. The electrodes are produced by providing a body of insulating material with parallel hair-like grooves on its face, and with two roughened strips which adjoin the

grooves alternately, rubbing the body with graphite, and forming by a galvanoplastic process conductors in the grooves and on the roughened strips.

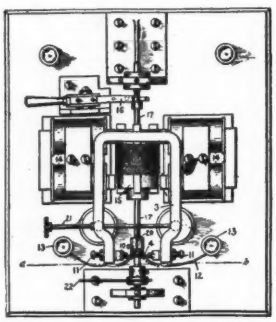
919,081. AUTOMATIC MAIL-SLOT ALARM. Lewis M. Robinson, Matteawan, N. Y. Filed December 11, 1908. Opening of the slot closes an electric-alarm circuit.

919,089. LEVER-CHECK FOR ELECTRIC CONTROLLERS. John Thomas, New York, N. Y. Filed January 27, 1909. Includes a star wheel and a pawl for regulating the speed of adjustment of a drum controller.

919,113. TELEPHONE APPARATUS. Charles Adams-Randall, New York, N. Y. Filed July 28, 1906. Combined with a telephone transmitter constructed in fractional parts capable of independent operation are means for regulating the current passing through the transmitter in proportion to the number of parts required to adapt it for long or short main-line circuits.

919,115. ANTENNA FOR WIRELESS-TELEGRAPH SYSTEMS. Clifford D. Babcock, New York, N. Y. Filed January 24, 1906. Between two masts of a ship are a pair of horizontal wires and a pair of vertical wires forming a continuous antenna loop lying in a vertical plane.

919,123. SPARK PLUG. James W. Brown, Jr., Camden, Ark. Filed September 23, 1908. Consists of a bushing with an insulating sleeve, a contact stem extending through the sleeve, a button-shaped electrode journaled for rotation on the axis of the stem and another electrode spaced at a fixed distance from the edge of the rotary electrode.



919,137.—OSCILLOGRAPH.

919,137. OSCILLOGRAPH. John T. Dempster, Schenectady, N. Y., assignor to General Electric Company. Filed February 14, 1908. Combined with a galvanometer comprising a field magnet is a conductor mounted between its poles so as to vibrate about two intersecting axes, and current-responsive means for vibrating the conductor about its longitudinal axis, and means for vibrating it about the other axis at a rate which bears a definite relation to its rate of vibration about the first axis.

919,142. APPARATUS FOR PUMPING OIL FROM PETROLEUM WHEELS. Karel E. Ehrmann, Bajoeng Lentjir, Sumatra. Filed November 22, 1907. An electrically-controlled system for raising oil from the well by compressed air.

919,165. ELECTRIC SMELTING FURNACE. Herbert C. Harrison, Exton, Pa. Filed May 4, 1908. A furnace of the arc type is adapted to use polyphase currents and is provided with a number of vertical arc electrodes placed in a row and a metal bottom connected with the molten bath in the furnace.

919,178. CONVEYING APPARATUS. Edward N. Johnston, U. S. Army. Filed May 6, 1908. On an aerial cableway moves a carriage driven by ropes from an electric motor, the controller for which may be attached and detached from the carriage.

919,179. ALARM. Joseph S. Jones, Spokane, Wash., assignor of one-fourth to Christopher Napoleon Adelley, Spokane, Wash. Filed October 16, 1907. Renewed December 28, 1908. Two contact terminals of a fire-alarm circuit are separated by a spring-tensioned cord which, when destroyed by fire, releases the alarm.

919,203. DYNAMO VENTILATOR. David R. McCullough, Pocatello, Idaho. Filed April 16, 1908. A dynamo has a sectional housing, a ventilator fan on one side of the machine driven by the armature shaft, a casing enclosing the fan and provided with radial perforations, an inlet pipe opening at a point remote from the machine and communicating with the fan casing, and adjustable shutters in the housing on the opposite side of the fan.

919,263. TROLLEY HARP. Lewis J. Tetlow, Holyoke, Mass., assignor to New England Trolley Wheel Company, Holyoke, Mass. Filed November 14, 1908. Comprises opposed jaws and a uniting tubular base, a stem fitted through and secured within the base and having its upper extremity constructed with an upwardly opening slot, one of the jaws having a pole opposite the slotted end of the stem.

919,264. GAS OR VAPOR CIRCUIT-BREAKER. Percy H. Thomas, Montclair, N. J., assignor to Cooper Hewitt Electric Company, New York, N. Y. Original application filed June 27, 1903. Divided and this application filed April 25, 1905. Renewed September 4, 1908. The removable element consists of conducting liquid in a suitable chamber having a number of terminals connected with the liquid, and a check valve closing the chamber, the height of the liquid being such as to produce a temporary seal for the check valve on open position.

919,267. SYSTEM OF ELECTRICAL DISTRIBUTION. William A. Turbayne, Lancaster, N. Y., assignor to Charles M. Gould, New York, N. Y. Filed October 30, 1903. A storage-battery system using counter electromotive-force cells for regulation is described.

919,276. SPARK PLUG. Theodor Winestock, Stuttgart, Germany, assignor to Otto Charles Winestock, Perkinsville, Vt. Filed April 30, 1908. Comprises a fixed member, composed of a cylindrical body with a threaded neck at one end and cam slots at the other, and a removable member, carrying both spark terminals, and provided with handles having portions adapted to enter the cam slots.

919,279. AIR DEFLECTOR FOR DYNAMO-ELECTRIC MACHINES. Frederick W. Young, East Orange, N. J., assignor to Crocker-Wheeler Company, Ampere, N. J. Filed December 6, 1907. Combined with a rotor having radial poles is a deflector individual to one end of each of the passageways between the rotor windings.

REISSUE.

12,943. TELEPHONE-EXCHANGE SYSTEM. Edmund Land, Grand Rapids, Mich., assignor to Milo G. Kellogg, Chicago, Ill. Filed August 9, 1906. Original No. 818,540, dated April 24, 1906. Relates to an automatic trunk-selecting switch in the central office.

PATENTS THAT HAVE EXPIRED.

Following is a list of electrical patents (issued by the United States Patent Office) that expired April 27, 1909:

473,504. ELECTRIC SWITCH. H. K. Hitchcock, Louisville, Ky.

473,514. INDUCTION-DISCHARGE PROTECTOR FOR WELDING APPARATUS. H. Lemp, Lynn, Mass.

473,532. TWO-WIRE TELEPHONE SYSTEM. G. Taintor, Keene, N. H.

473,536. ALTERNATING-CURRENT ARC LAMP. B. B. Ward, New York, N. Y.

473,538 and 473,539. ELECTRICAL MEASURING INSTRUMENT. E. Weston, Newark, N. J.

473,547. DYNAMO-ELECTRIC MACHINE. W. Decker, Owego, N. Y.

473,567. COMMUTATOR CONNECTION FOR ELECTRIC MOTORS OR GENERATORS. C. G. Curtis, New York, N. Y.

473,568. ARMATURE FOR DYNAMO-ELECTRIC MACHINES OR MOTORS. C. G. Curtis, New York, N. Y.

473,594. ELECTRIC CIRCUIT-CONTROLLING DEVICE. M. Thum, Louisville, Ky.

473,595. CIRCUIT-CONTROLLING DEVICE. M. Thum, Louisville, Ky.

473,618 and 473,619. DYNAMO-ELECTRIC MACHINE. R. Eickemeyer, Yonkers, N. Y.

473,674. ELECTRIC LOCOMOTIVE. S. H. Short, Cleveland, Ohio.

473,693. ELECTRIC LOCOMOTIVE. J. I. Conklin, Brooklyn, N. Y.

473,717. ELECTRIC CONTACT PROTECTOR. R. Varley, Jr., Englewood, N. J.

473,832. ELECTRIC SIGNAL FOR RAILWAY TRAINS. L. Dunn, Fort Smith, Ark.

473,848. ELECTRIC SWITCHBOARD. J. B. Mayer, Newark, N. J.

473,866. PROCESS OF OBTAINING METALS FROM THEIR ORES OR COMPOUNDS. C. S. Bradley, Yonkers, N. Y.

473,871. ELECTRICALLY-PROPELLED VEHICLE. F. Gardner, Chicago, Ill.